COAL AGE

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DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

SYDNEY A. HALE, *Editor*

New York, July, 1934

Equipped for the Moment

MANY MINES can produce coal without loss because their hauls are not long, but the economical life of such mines is, at best, only one or two years if the equipment is too light for long haulage. One may "get by" with light rail, narrow-gage, small cars and small locomotives for a while, but not for long, and a mine thus equipped, if it has a large area, has only a small part of it in the economic zone. As it will have to be equipped later, and as adequate equipment would yield more profit now than inadequate equipment, why not introduce it at once and have the present benefit that arises from its use?

It might be revealing if, on the mine map, a line were ruled showing the limits of economical operation with present equipment, for without new equipment all the coal beyond that line is worth absolutely nothing except to someone willing to expend the money for reequipping the mine, and all the money expended in tracking up to that point might just as well be spent in adequate track for the future.

High-Speed Ventilation

TOO LITTLE is being done to ease corners in the turning of air. At only 900 ft. per minute, a square turn resists the progress of air 2.33 times as much as a curve of 3-ft. radius at the inner corner and a 12-ft. radius at the outer corner in a heading 9 ft. wide, and more than 4.82 times as much as a curve of 6-ft. radius at the inner corner and a 15-ft. radius at the outer corner in a heading of the same width. With a higher velocity of current even greater differences will be found. Where velocities of 5,000 ft. per minute are used near the fan, the importance of rounding curves seems abundantly proved. These figures are based on the findings of H. P. Greenwald and G. E. McElroy, of the U. S. Bureau of Mines.

With vanes, perhaps even better results might be obtained at high velocities. Whether vanes are used or omitted, at least the rounding off of curves would seem to be desirable, especially as thereby the support for the roadway would be rendered more adequate, for the width of the heading will not be increased at the bend as it would be by making its outer corner square. The outer angle could be filled with rock, faced with concrete in forms. Preferably, the inner curve should be cut to templet and faced with projected concrete.

Must the Code Die?

NRA OFFICIALS frequently, and with good reason too, point to the bituminous code as one of the shining achievements of the recovery program. Increasing murmurs of discontent or worse, however, give rise to the disquieting thought that, unless there is a speedy recapture of the spirit which animated the industry last October, this landmark may disappear under a wave of sectional jealousies. Those who voice this fear couple it with criticism of the administration for its seeming unwillingness to compel compromise between the warring factions within the industry.

The roots of these complaints go back to the weaknesses stressed in the study of code operation and administration which appeared in the February issue of *Coal Age* (pp. 69-72),

with present emphasis centered upon price relationships. Admittedly these relationships do not lend themselves to easy solution because of the competitive issues involved, but these very difficulties suggest the urgency of NRA adopting more than a passive rôle in their settlement. In addition, enthusiasm for further NRA cost reports is ebbing and one division has definitely declined to continue voluntarily with this part of the program.

Nice apportionment of responsibility between NRA and the industry for the present situation is valuable only as it furnishes a guide for future action. The essential point is that no sane operator wants to contemplate reverting to the chaotic and ruinous conditions which prevailed less than a year ago. To prevent such a return some sacrifice of individual preferences and advantages for the general good and even some surrender of cherished local autonomy may be necessary. But that is not too high a price for profitable stabilization.

A Paramount Consideration

FEW PROBLEMS transcend in importance roof action. On it depends, in Illinois, the possibility of doubling the quantity of coal removed from the mine, in many places the advisability of mining coal under heavy cover and the opportunity for operating intensively by longwall. In Germany seams are laboriously backfilled and in Great Britain pack-walling is general. Both of these are expensive proceedings. Shall we be obliged to come to them as mines get deeper and one bed is worked above another? Can they be avoided by a knowledge of the apparent whims of the roof? Some declare roof is so irregular and uncertain that no mathematics will solve its problems. The reply is obvious.

Roof in nearly all regions is acting regularly and dependably as worked, so it must be homogeneous enough to satisfy in all cases the method of operation. If a practical solution will work infallibly, then a mathematical solution should be framable that will meet the situation. If a roof today breaks along the pillar line, and then thereafter—or for some time—"rides" the pillar, there must be a lack of homogeneity to explain the variation; but where there is no variation, there must be homogeneity, and a mathematical solution is in order.

But such uncertainty does not seem to exist in practice. If there are practical solutions, it will be said, why trouble about the mathematics which explains them? Again, the answer is obvious. A correct mathematical principle will enable a student to determine at any mine what method will afford a practical method of meeting the roof's problems.

Words, Just Words

OUR MINING LANGUAGE greatly needs revision. The tongue of the miner is being doubtfully enriched from all quarters, and every region insists that its words and interpretations of words must be accepted as the jargon of everyone in the mining field. Synonyms are needed, so no purpose will be served by lopping off duplicate or triplicate names for any one thing; but endeavor should concentrate on not having one name for several separate things which are either essentially unlike or so provokingly alike that one may be mistaken for another when distinction between them is essential.

Many have not made up their minds what any given part of a mine should be named, but use certain terms indefinitely to apply to several parts of a mine. One authority, for example, insists that longwall without pack-walls is not "longwall" but "longface"; another group would define "longwall" as a continuous face growing larger with operation; "longface," a wide working between parallel roadways. Some would make an entry a group of headings; others would make a heading a group of entries.

"Slate" is quite frequently applied to rock which consists almost entirely of silica, and qualified only in appearance as slate by reason of its fine grain. Such nomenclature argues technical uncertainty. Perhaps "schist" is a useful and broader word with wider connotation, but it would apply to all materials between coal beds. Terminology studies will uproot many fallacies that incorrect technique has created. "Methane" was once tabooed as too scientific, and the word for the mixture "firedamp" was preferred as the better name for the particular gas in question. But custom partly has corrected this, as it will other misnomers if a technical standard is established. Glossaries must give way to dictionaries, and definite terms replace words of uncertain meaning.

WAGE RATES TREBLE

+ But Total Labor Costs Per Ton Decrease

At Union Pacific Mines

By EUGENE McAULIFFE

President, Union Pacific Coal Co.

FORTY-FOUR YEARS AGO, the base hourly rates for inside labor in the mines of the Union Pacific Coal Co. were 25 and 15c. Today the base rate is 77.5c. per hour. Despite this great increase in hourly rates, however, total labor costs per ton are lower than they were in 1890. Continually increasing efficiency, made possible by increasing capital investment in equipment for mechanization and alert management, which Mr. McAuliffe modestly glides over in this article, are responsible for this record.

INITIAL DEVELOPMENT of the properties now controlled by the Union Pacific Coal Co. started at Carbon, Wyo., where 6,560 tons was produced in 1868. During the same year, 365 tons also was mined near Rock Springs, Wyo. Carbon ceased to be a producer in 1902, but Rock Springs has been making its annual contribution to the output of the property for 66 years. The wages paid, hours worked per shift and the cost of production in all districts are a matter of record with the company. These records make it possible to compare wage rates and production costs in earlier years with those of the present day.

In 1890, for example, the basic wage paid white labor working inside the mine was $2.50 for a 10-hour day; Oriental labor was paid $1.50. The 10-hour day continued until Sept. 1, 1907, when the 8-hour day was adopted. Under the recent amendment to the Code of Fair Competition for the Bituminous Coal Industry, a 7-hour day was established effective April 1, 1934. Prior to 1903, tonnage rates were on a gross-ton basis, with a 30 per cent deduction for slack. As a result, under a 70c. rate per ton, the miner actually received only 43.75c. for each 2,000 lb. loaded.

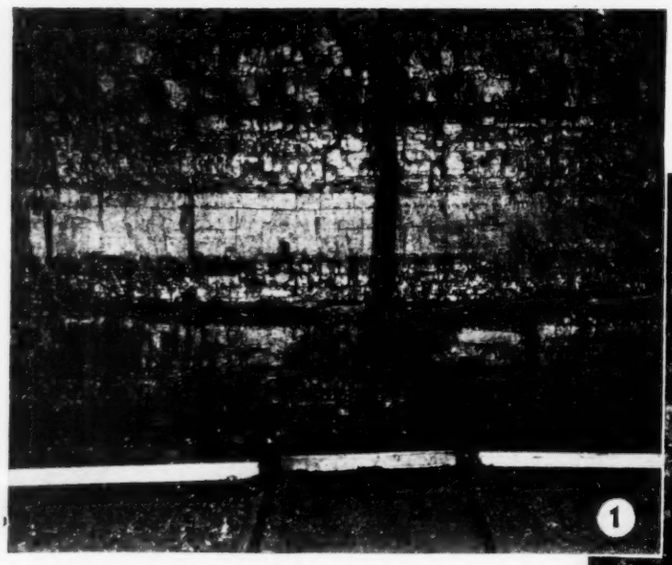
Last year, the basic minimum rate for inside skilled labor was 67.75c. per hour. Notwithstanding the great increases in current basic rates over those prevailing in the '90s and the early years of the present century, the labor cost in 1933 was 9.1c. per ton less than the average of the labor costs for the three years preceding the advent of the 8-hour day. The explanation of this achievement is to be found in increased capital investment and improved technique.

The principal changes that have made it possible to produce coal today with an hourly labor cost 210 per cent above that of 1890 include the substitution of electricity for steam hoists and pumps. Electricity also made possible the present-day cutting machine, the haulage locomotive and the loading machine. Electrically driven fans located over exhaust airshafts miles away from the boiler room also have added much to ventilation and to safety.

In 1890, the company had no electric power. Coal was cut with four air-driven Legge chain coal cutters and a few air punchers. The mine cars had a maximum capacity of 1,500 lb., as compared with the 3½- to 4-ton capacity of the equipment now in use. The first electric locomotive, a 9-ton terrapin-back type unit equipped with one 60-hp. 500-volt d.c. motor and geared to a maximum speed of 8 miles per hour, was not purchased until May 16, 1892. This was one of the first two electric locomotives built. A few years ago, it was inducted into the Union Pacific Coal Co. Old Timers' Association under the name of "Charlie Smith," its former operator, and now occupies a position of honorable retirement in front of the Old Timers' Building at Rock Springs.

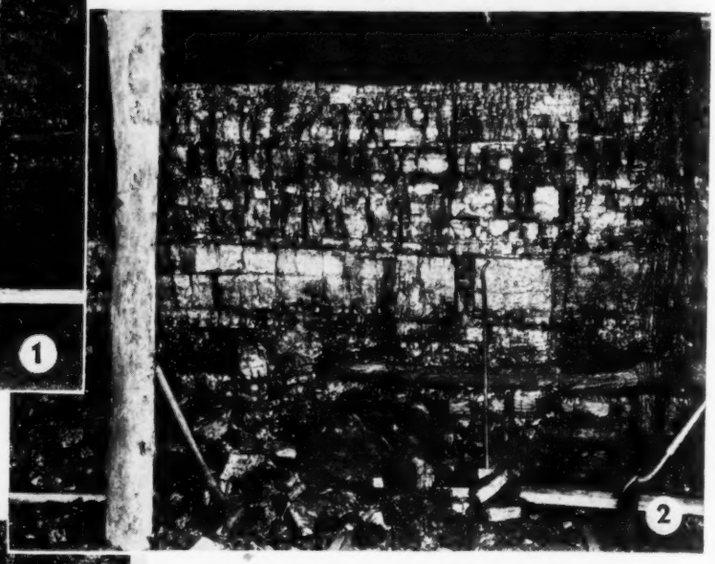
In contrast to this meager equipment of 1890, the company today is using 124 electrically operated shortwall mining machines, 81 mine locomotives, 49 motor-generator sets, 110 electric hoists, 145 motorized loading machines and 183 electric drills. Operation of these machines and other equipment such as tugger hoists and blower fans involves the employment of over 1,300 motors.

An occasional back-sight such as that taken by the management of this company suggests that so-called "mechanization," the result of scientific technique contributed very largely by the manufacturers of mining machinery and equipment, reinforced by the U. S. Bureau of Mines, plus substantial capital investment, has made it possible for the industry to pay wages in 1934 equivalent to 310 per cent of the wage of 1890. If the methods employed in mining coal in Wyoming in 1890 were followed with the present scale of wages and hours in effect, the market price of mine-run would be at least $2.25 per ton higher than the present code price. The answer is an obvious one: Very little coal would be used.



Undercut and Sheared, Cuttings Cleaned From the Kerf and Loaded, and Two-by-fours Placed in Correct Position.

The Left Half of the Face Has Been Shot and the Coal Has Moved to the Right Until the Kerf of the Shear Cut Is Closed and Appears Only as a Vertical Line.



Both Halves of the Face Loaded Out Down to Upper Binder. After This Binder Is Skinned Off and Cast Aside, the Next Layer of Coal Will Be Loaded. The Fines Between the 2x4 and the Lower Face Are Shoveled to the Refuse After the Lower Binder Has Been Skinned Off.

Left Half of the Face. Being Loaded Out Down to Within a Few Inches of the Upper Binder. While Loading Coal No Shoveling Is Done Between the 2x4 and the Face of the Lower Bench.

An Inspector Views the Coal From Each Car as It Passes by in a Thin Layer on an Apron Conveyor En Route Between the Dump and the Shaker Screens.

FACE PREPARATION

+ Stressed at Anchor Mines

And Pedigree of Every Car Recorded

LOADING clean coal and obtaining the highest possible percentage of large sizes under a given natural condition requires not only determination and institution of a method best suited to that condition, acquisition of necessary equipment to do the work, but also constant supervision of the loaders and recording all the facts that will help trace the source of any coal which may arouse complaints. Methods employed at mines of the Anchor Coal Co., Highcoal, Boone County, West Virginia, are illustrative of a system which has proved its effectiveness in promoting the loading of clean coal at the face, obtaining maximum lump, and recording an accurate pedigree of each carload shipped.

To ship clean coal is the primary goal and, fortunately, most of the effort directed toward loading clean coal at the face can be credited with reducing cost. Impurities not loaded inflict no loading cost, do not reduce mine-car and locomotive coal-handling capacity, are free from power cost for gathering and hauling, and incur no charge for picking out at the tipple and haulage to the refuse dump.

The Anchor company operates two drift mines in the Dorothy seam served by a central tipple. The coal, which lies practically level and averages 90 in. in thickness, is a multi-bedded splinty coal analyzing about 33 per cent volatile, approximately 4 per cent inherent ash, and well under 1 per cent sulphur. In some sections the roof is a sand rock and in other sections a drawslate of sufficient thickness to be timbered and held in place. The bottom is hard shale. Two shale binders, each ranging between 1 and 4 in. in thickness, occur near the bottom. One is 12 in. from the bottom and the other 24 to 30 in. from the bottom.

The bed is undercut to a depth of 6 ft. with shortwall equipment and sheared on the center line with a Goodman machine equipped with swivel truck. The undercut is positioned to leave 4 to 6 in. of bottom coal which is never taken up, thus eliminating the possibility of the miner scraping up any pieces of the bottom shale when shoveling coal.

All machine cuttings are removed from the kerf and loaded into a mine car prior to blasting. All holes are drilled by the miners and must be parallel to the line of sights, so that there will be no gripping shots fired. Holes are charged with pellet powder tamped with clay around a needle, and the blast is ignited with a common squib. Two light shots are used, and the second is never fired until after the miner has cleaned out a space at least 3 ft. wide to full depth along the shear cut and down to the upper binder. This in effect widens the shear kerf to 3 ft., thus providing ample expansion space for the coal to be loosened by the second shot.

To keep out certain impurities that might otherwise be loaded with the small-sized coals, the following methods are rigidly enforced at the face: Prior to the shooting, the miner must lay wooden 2x4's on the bottom parallel to the face and at a distance from the face equal to the height of the higher binder.

▼

Keeping the Pedigree

The "Inspection Table Report" form (left) is made out in triplicate by the inspector at the inspection conveyor in the preparation plant: one copy, printed on white paper, goes to the Cleveland office; a second, on blue paper, goes to the mine foreman, and the third copy, on yellow paper, is filed in the mine office. The size of this form is 5x6 in.

The "Dock Report" form (right) is filled out in the mine office and sent to the mine foreman, who must notify the offending loader, sign the report and return it to the mine office for filing. This form is printed on white paper, size 6x6¼-in.

ANCHOR COAL COMPANY

Inspection Table Report

DATE

SLATE — COAL

DOCKS — SIZE

QUALITY

SUSPENDED

GENERAL REMARKS

DISCHARGED

APPEARANCE COAL REGARDS SLATE

INSPECTOR

ANCHOR COAL COMPANY

Report No.

DOCK REPORT

Mine No. — Date ..... 193..

Check No.	NAME	Date Notified

The above loaders of dirty coal have been notified by me on dates entered.

Mine Foreman.

Rules and Regulations for Loading Coal for Anchor Coal Miners

BLASTING

1. If you are a new employee you must not start loading coal until a foreman or coal inspector has accompanied you to your working place and explained THOROUGHLY our method of loading coal.

2. Before shooting and after all dust has been loaded out, place a 2x4-in. across front of coal to be shot, within 3 ft. of the face of the coal.

3. No more than one shot shall be fired at any one time; the second shot must not be fired until a space at least 3 ft. wide has been cleaned out above top dirty band back to the solid coal in center of room, or the back of the cut made by the mining machine.

4. Previous to shooting in any place the machine cuttings must be cleaned out of the cut made by the mining machine back to the solid coal. All machine cuttings must be loaded into mine car or cars unless special orders are given by the foreman or the machine has cut into the bottom; then the cuttings must be thrown back into the gob.

5. There must not be any holes drilled gripping; drill holes straight with line of sights.

IMPURITIES NOT TO BE LOADED

1. Normally there exist three bands of dirt in the seam of coal we are mining, commonly known to the miner as "dirty bands"; they are located all of them within about 2½ ft. of the bottom; these bands under no consideration are to be loaded in the mine cars with coal.

2. There is at times throughout the coal seam, at times near the top, other times near the bottom, a streak of dull gray substance which we class as "bone" coal; this must not be loaded with other coal in cars.

3. If at any time a fall of roof slate occurs on top of the loose coal do not attempt to load the coal until it is pronounced O.K. by the foreman or coal inspector.

4. If at any time the mining machine cuts into the bottom or up into the dirty band, the cuttings must all be thrown back into the gob.

5. We load dirt from time to time into the mine cars and dump same over the dirt dump; at times, especially when the dirt loaded is wet, there will be some of it cling to and remain in the mine car after it has been dumped. When you receive an empty car from the motorman look into it before you load any coal into the car.

METHOD OF LOADING

1. After coal is shot begin your loading above the top dirty band, leave a strip of coal sticking to the band about 4 in. thick, to shovel off of; this will prevent you from scraping any of the band up into your shovel while you are shoveling.

2. As long as you have coal above the dirty band to load do not shovel any closer to the front edge of the cut than the edge of the 2x4-in. that you placed there previous to shooting.

3. After all top coal above top dirty band has been loaded, remove the coal left sticking to dirty band to shovel off of together with the two top dirty bands and throw back into gob; under no circumstances shall any part of this be loaded as coal.

4. After two top dirty bands have been removed and thrown back into gob, then clean out all coal that has accumulated between the 2x4-in. and the face of coal that can be loaded by hand and put it into the car as coal.

5. After this coal and dirt that has accumulated between the 2x4-in. and the face has had all the large pieces of coal picked out of it by hand, then remove the 2x4-in. and shovel all this fine coal and dirt back into the gob. If sufficient space is not available in the gob, apply to foreman in charge for a car to load dirt into.

6. After the coal and dirt accumulated between 2x4-in. and face has all been cleaned up, then load the next coal into the car down to the third dirty band from top, then remove this band.

7. After third band from top has been removed and thrown back, then the remaining coal down to the coal left by the mining machine as bottom coal can be loaded.

8. When loading the last coal at the bottom be sure the mining machine has not cut into bottom fireclay and left small pieces of dirt which will be shoveled up.

ANCHOR COAL COMPANY

All coal above the binder must be loaded before the lower bench is touched, and when loading out that upper bench no shoveling is to be done in the space between the 2x4 and the face of the lower bench. Any coal loaded from this space must be picked up by hand. When loading the upper bench, 2 to 4 in. of coal is left on top of the binder to provide a clean floor on which to shovel. Special care is exercised in lifting this remaining layer.

After the upper binder has been skinned off and gobbed along one side of the room, the next layer of coal is loaded and then the binder cast to the gob. The next step is to dispose of the material, mostly coal, that has accumulated between the 2x4 and the face of the dislodged cut. Lumps of coal that can be picked up by hand are loaded from this space, and the remaining material, principally fine coal, but containing some binder, must be shoveled to the gob.

In order that a newly hired miner, if he is summoned for loading dirty coal or otherwise violating company regulations, cannot offer the excuse "nobody told me about that," the actual hiring of an individual is delayed until he is handed a copy of the "Rules and Regulations for Loading Coal in Anchor Coal Mines," allowed time to read it, and then when questioned says that he can load coal according to those regulations.

Since the degree of enforcement of these rules is the true measure of accomplishment, several means are provided for supervising the loader and pinning him to a strict accounting of the quality of coal he loads. Blasting records are one example. Kept on file in the office is the performance of each man as regards the tons of coal he produces per pound of explosive used.

Each section foreman is held responsible for quality of preparation of coal from his mining section and must keep available a record of the name, check number and location of each coal loader. In addition, an inside coal inspector is employed to devote his full time to policing the working places and enforcing all rules and regulations affecting face preparation.

At the tipple, which was modernized last year, an apron conveyor is provided to afford inspection of each car of coal in its mine-run condition. This conveyor operates in conjunction with a distribution conveyor, but runs at a higher speed so that the coal is spread thin; this decreases the chance of impurities being concealed in the layer of coal. Another coal inspector spends his full time viewing the coal passing over this conveyor.

When this inspector discovers a piece of dirt, he makes notation of a dock and signals to the weighman, who furnishes the check number of the car involved. For each check number receiving a dock during the day the inspector fills out in triplicate an "Inspection Table Report." A white copy is sent to the general office in Cleveland, a blue copy is given to the mine foreman, and a yellow copy is filed in the office at Highcoal. The mine foreman is also given another "Dock Report" form, which he must sign and return to the office. This shows the date he notified the loader of the dock and is kept on file for future reference.

For each railroad car of lump and egg loaded, the weighmaster must tabulate the check numbers and weights of all mine cars that contributed to the loading. When the loading of a car is completed, the loading-boom operator calls to the weighmaster through a speaking tube, giving the car initials and number and communicating his general opinion of the coal in that car. The man at the inspection table likewise notes his opinion of the coal that went to make up that carload.

If a complaint is received regarding a certain railroad car, all of the information necessary to determine the reasonableness of that complaint and to locate a bad condition or practice, if one exists, is on file. First the comments of the inspection-table man and of the loading-boom operator regarding that particular car are noted. Next the mine foreman is called to furnish the exact locations of the working places from which the men of the listed check numbers loaded the coal. Finally, if thought necessary, the superintendent of mines will inspect all of those working places before making his final report of the complaint to the general office.

The Anchor mines are now producing about 1,500 tons per day, but by recent improvements are equipped to step the output up to 2,400 tons. Officials active in the management of the company are Frank L. Hornickel, Cleveland, president; G. H. Hornickel, Highcoal, general superintendent; and Van B. Stith, Highcoal, superintendent of mines.

LONGFACES AND ROOMS

+ In a Pitching Anthracite Mine

At Salem Hill Colliery

LONGFACE workings on a pitch of 30 to 40 deg. with mechanical undercutting up that steep face, and triple shifting of mine operations are features of production at the Haddock Mining Co.'s Salem Hill mine, which are rarely found in the United States. This newly opened mine, though small, is remarkably well conducted. One of the unusual features is the practice of running the mines in the summer on development and during the winter mainly for coal getting, though in winter and summer alike development proceeds triple shift.

Salem Hill Colliery lies just outside the City of Pottsville, to the east. This section of the southern anthracite field has perhaps more coal seams than any other in the United States. Only when one has dropped below all the seams that are or have been worked on the property does one begin to recognize the names of the beds: Little Tracy, Tracy, Little Diamond, Diamond, Little Orchard and Orchard. One wonders if the seams operated are not of the Dunkard Series of the early Permian. As is often the case in the anthracite region, the identification of the beds is a little in doubt. In Table I will be found a list of the seams in the southern field of the anthracite region arranged in order. Most of these probably will be found on the property.

Entrance to the mine is made by a cross-measure drift, a few feet above water level in the valley of the Schuylkill River. This drift extends north about 1,500 ft. until it strikes the Rabbit Hole seam, in which a slope has been sunk which runs on a pitch of 30 to 39 deg., but parallel in plan to the entering drift and only a few feet away from it. In consequence, the entrance of the drift and the end of the Rabbit Hole workings are very close to one another, as seen in plan, but several hundred feet apart in elevation. At equal distances, levels have been laid off in the Rabbit Hole seam to the left and right —that is, roughly east and west—and from these Rabbit Hole levels on the west side of the slope have been driven horizontal tunnels, again doubling on the slope and running parallel to the main cross-measure drift and thus forming the base of a letter Z, a short base indeed but long enough to reach the Tunnel bed, which, as Table I shows, is the next below the Rabbit Hole. From the intersections of these cross-measure tunnels with the Tunnel bed, levels right and left—that is, east and west—are driven toward the boundary of the property. All the tunnels have a gradient of ½ per cent in favor of the load.

TABLE I

Seams Found in Southern Anthracite Field

Stray seam
Burke or Brewery
Stray seam
South Salem
Salem
Faust
Rabbit Hole
Tunnel
Gate, Peach Mountain or Black Mine (probably all the same seam)
Little Tracy
Tracy or Selkirk
Little Diamond
Diamond
Little Orchard
Stray seam
Orchard
Stray seam
Primrose
Holmes, Church or 4-Foot
Four Foot
Mammoth
Skidmore
Seven-Foot or White Ash
Rough
Stray seam
Buck Mountain
Lykens 1-6 inclusive

Operations of the Salem mine date back to Pottsville's early days, and the gangways ceased to be extended after 1852. For a while the development of the southern field lagged, but a better era dawned about the beginning of the century. The Salem workings still lie full of water to within 20 ft. of the main cross-measure drift. They have great value as a source of water for the Salem Hill breaker. Some day the mine will be pumped dry and the rest of the coal will be removed, for it has acreage entirely undeveloped, probably some development headings driven but still without chambers, and some chamber pillars. Below the Salem lies the unminable Faust and next the Rabbit Hole, perhaps not unjustly named, for it is only 2 ft. to 2 ft. 6 in. thick, whereas the Tunnel bed is 7 ft. in thickness.

Because the Rabbit Hole bed was so thin, long-face methods became imperative. Also, to save expense, the levels were driven without return airways, using an auxiliary fan and fabric pipe. They were thus extended to the boundary of the property. There was no breaker at that time and nothing but development was attempted. Today, when extraction will advance with development, the use of fan and pipe will be abandoned in future levels, and air will enter by an airway and return by a level in the ordinary manner. As in all anthracite mines, the contours of the seam are irregular and the levels have to conform themselves to the contours, making the gangways somewhat crooked and the distance between levels quite irregular. The contours are straighter at Salem Hill than at many mines one might mention, but the long faces run, nevertheless, from 250 to 280 ft., somewhat further than the distance between levels, for the long faces are cut a little on the bias, thus lengthening the working face.

In many European mines, the machine cutter is held in place by a hoist at the upper end of the long face, putting the control of the hoist in the hands of a third man, who is not only supernumerary but also can be made to perform his duties only by signal. The Goodman and Sullivan longwall cutting machines carry their drums on their backs, and the machines are held in place and moved up the pitch, which is the direction of cutting, by winding on ropes attached to jack posts set between roof

and floor. There are two drums on each cutter. Consequently, there are two means of support should a jack pipe drag loose, which it rarely does, and there is a means of support when a jack pipe is being moved to a point further up the face. With the drum mounted on the back of the machine, the cutter is not 12 in. high but about 18 in., but the seam has been thick enough thus far that this increased height is no detriment.

250 to 280 Ft. Per Shift

The crew consists solely of two men, a cutter and a helper, both of whom usually are young high-school graduates and of more than average intelligence. They can cut the full 250 to 280 ft. in a single shift, enough to satisfy the loading requirements for two shifts, which is as many shifts as have been worked hitherto in the longface operations. Six- or eight-inch diameter posts are set on 4- or 5-ft. centers to support the roof, which, though comprising on its underside 2 to 4 ft. of clod, holds fairly well for a while, but after a matter of a few weeks, something, possibly the limestone, in this clod swells and forces it down. By that time, however, the face has moved along, and the failure of the clod creates no difficulty. It falls among the posts and furnishes some support as the roof lowers and the bottom rises to meet and carry the burden of the main roof. No deep holes are made in which to sink the posts, but a little of the sandy shale is scuffed off with the pick before a post is set. These roof supports are erected a few inches out of a normal to the bed, the upper end being the further up the pitch, so that any movement of the roof tends to make the posts more nearly at right angles to the floor, thus tightening rather than loosening them. This is general practice in pitching seams everywhere in the anthracite region, and is mentioned here only because, in certain British mines with longwall and soft bottom, it has been found that the bottom moved downhill relatively to the top, so that the leaning post, instead of tightening, fell over.

Wedged cap pieces are set, running up and down the pitch. These are 12 or 14 in. long, 6 to 8 in. wide, so as to cover the post, and about 1½ in. thick. They are made of mill scrap. Posts are not pointed. The coal seam is cut in the bottom close to, but above, the floor. Fortunately, this section of the seam is readily cut. Kerfs are made about 5½ ft. deep. Sometimes the coal when shot would fall along excessive lengths of face, and to prevent having coal falls that were so big that they could not be readily reduced to suitable loading proportions, wood wedges, or sprags, had to be inserted under the cut at intervals, so that shots would not bring down any more coal at one time than readily could be handled. The face in many cases

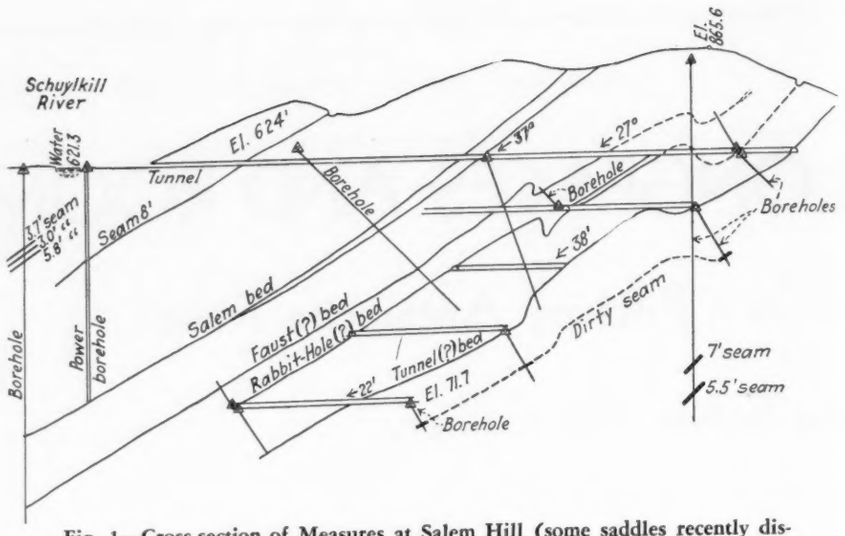


Fig. 1—Cross-section of Measures at Salem Hill (some saddles recently discovered are not shown).

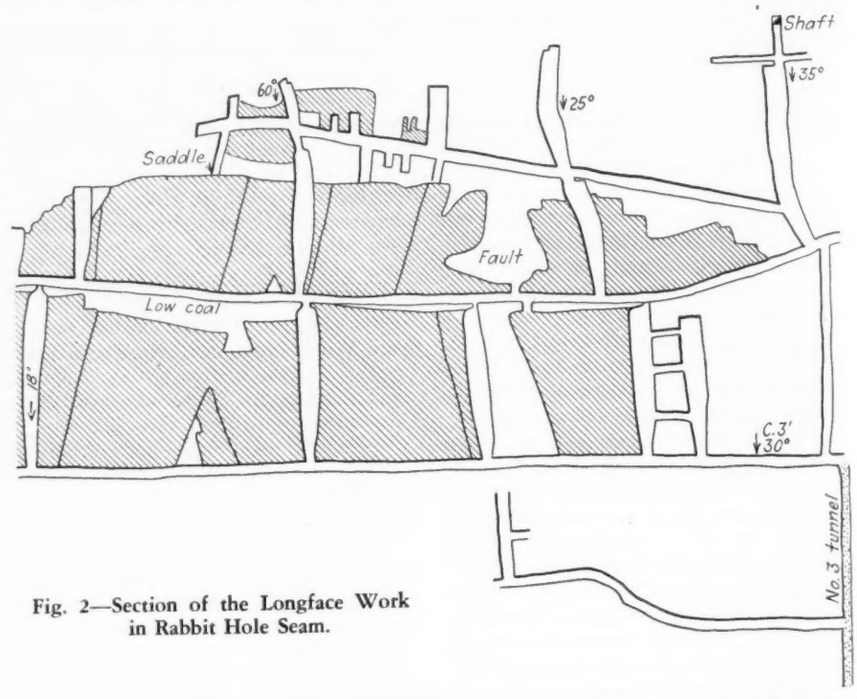


Fig. 2—Section of the Longface Work in Rabbit Hole Seam.

was willing to fall without being shot, if no sprags were used to hold it up.

Broken coal at this mine has hitherto refused to slide readily down the face on sheets of iron, even though galvanized sheets are used everywhere at this colliery. Such sheets are favored to prevent corrosion as much as to afford more easy movement of the coal on the pitch. As the coal would not run, being hindered by the bug dust, which is sluggish on any but a pitch exceeding 35 deg., 35-hp. double-drum hoists have been provided and the coal is aided in its descent by scrapers, the work of dislodging the coal by light shots starting at the upper end. As soon as a section of the coal face is cleared of coal by the scraper, posts are erected to retain the roof. The face is kept at the top in advance of the bottom, so that coal, in falling down the pitch, will keep near the face, and coal falling away from the face will trend back to it and be collected by the scraper. This also is the safer way to operate.

The scrapers, though small in themselves, bring down about 30 cu.ft. of coal in each trip, for much coal is driven ahead of the scoop. Sometimes the clod, in places which have been standing a long time, has been found to have fallen. In the workings hitherto operated, chambers were driven up between levels at intervals, and work was started on the ribs of these places, usually retreating but sometimes advancing. In such places, it was necessary to clean

up the clod before the cutting machine could get to work.

From now on, the work will be wholly on the advance, and no trouble probably will be experienced with the clod. The pitch is expected to be heavy enough hereafter, that the coal will run down without the help of a scraper. Not only does the clod fall in a confused mass, but the bottom also heaves, and the roof descends to meet the clod. Thus, the weight of the roof is taken by the floor. In no case does the heaving of the floor cause trouble with methane, of which the bottom is entirely free. The greatest inclination thus far has been 39 deg., but in the immediate future it may be necessary to cut faces running as steeply as 44 deg. However, no difficulty is anticipated on this score, and, even if it were to cause trouble, the inclination could be suitably reduced by making the cut more on the bias.

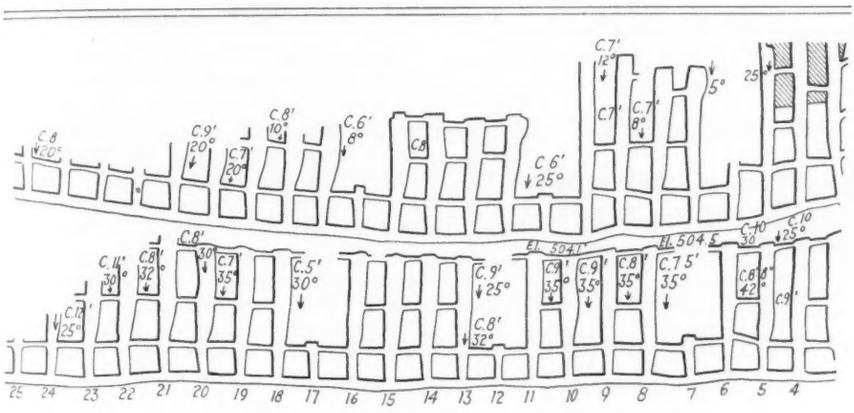


Fig. 3—Section of the Chamber-and-Pillar Work in Tunnel Seam.

Lives of managers in the anthracite region would be made much happier if the beds would travel down the pitch without the introduction of saddles or rolls. Unfortunately, a bed rarely goes straight down the pitch. Once in a while, these beds will have a fold and the upper level workings come up against such a saddle, where, instead of a pitch of 30 to 39 deg., there is a short dip of varying inclination, in one place reaching 85 deg., which upsets all calculations but serves, nevertheless, to make the management appreciate the more the conditions obtaining where the dip is uniform. As the dip runs nearly south, the saddles, and there are at least three thus far, run east and west. Also the beds occasionally are lost or reduced, as if pressure had squeezed them when still in the plastic state, for they usually reappear larger than ever. In this mine, apparently, no true faults have been found, and none of the coal losses have necessitated lengthy probings or long tunnels, but they are vexing, nevertheless.

Hereafter, as stated, the longface work will be developed by a gangway and an airway joined at 25-ft. intervals by crosscuts or chutes which will be about 15 ft. long, as shown in Fig. 4. At a point about 7½ ft. from the gangway, the chutes will widen right and left—except the first one, which will widen only inbye—at an angle of 45 deg. The longfaces will be directed at an angle depending on the dip of the seam and experience. The coal, which will run on the floor, will travel through one of these chutes and be directed to the discharge point by the inclined sides of the chute. As soon as the coal face has moved forward sufficiently that the broken coal can no longer use the chute it has just recently been traveling, that chute will be stopped with a tile brattice which will be covered later with cement on the side of positive pressure —in this case, the airway side. When thus coated, the cement mortar is forced into any open crevice and fills it instead of being forced out. This is general practice at this mine. It makes the brattice more leakproof.

Levels are shown 225 ft. apart, but that distance will vary. Probably a small pillar about 10 ft. wide will be left between the top of the workings in the level being operated and the level above it. That level is also protected by a line of cribs on the upper side, so it is expected that the air will continue to find it sufficiently open for entry. Some air will flow down the face ,and some will travel through the unclosed goaf back of the face. Thus it will travel partly up the airway and partly through the chute down which the coal is traveling. Of course, this plan is predicated on present conditions with about 500 ft. of cover. With greater depth a new pattern may have to be devised and followed and this plan may not prove entirely feasible even today and need minor revision. However, there would seem to be no reason to believe that it will not prove at least as satisfactory as the method or methods it replaces.

With 7-ft. coal in the Tunnel bed, the management favored the use of the chamber-and-pillar method. The coal in the bed is a little disposed to be dislodged without shooting, but as the inclination is only a little over 30 deg., that tendency is not likely to give much trouble. Yet 26 linear feet of coal after shooting have detached themselves or been detached by gas pressure in one place, and the possibility of such slide shutting down the gangway, imprisoning men or shutting off the air in the gangway is worth guarding against, so chambers are not opened all along the gangway but in groups of four, and in the deepest level in groups of three, by leaving one room out in every five or in every four, as the case may be.

The wide blocks of coal thus left are at this mine described as "reserve pillars." This practice also prevents a squeeze once started from continuing unobstructed all over one side of the main slope. It must be remembered that the pillars are to be left for some time. None have been as yet withdrawn. They hold up the roof, which constitutes the floor on which operations are being conducted in the Rabbit Hole seam above. However, as the boundary of the property is approached, this precaution is not taken, as less and less of the territory needs protection.

Roof in the Tunnel seam is never good. Left to itself it will cave to a height of 8 ft. in a narrow place. Its proneness to fall is inherent and is not the outcome of chemical action, drying or moistening, though it responds to some such actions, for quite usually it will destroy the first sets of timbers and require retimbering. The chambers are widened at a point about 10 ft. above the airway, and, if the roof will permit, they are made 20 ft. wide, but sometimes it is necessary to use heavy collars across the chamber with large timbers and to put lagging over the collars. Room width also has to be narrowed. No standard method of timbering has been adopted. The rule is to timber as much as is necessary. The coal in the Tunnel bed is not undercut, but shot off the solid.

Chutes at 50-Ft. Centers

All the gangways have an airway, and at each chamber a crosscut or chute is provided, so that the chutes are at 50-ft. centers, a chute being provided at the center of each reserve pillar as if it were going to serve a chamber like the other chutes. Galvanized sheet iron is used in these places. The chambers are from 275 to 300 ft. long. Scrapers are not used in any of the chambers. When saddles disturb the regular inclination, 40-cu.ft. steel buggies are provided, and the coal is shoveled into these, and the car run down or pushed up on tracks to a point in the chute where the inclination will suffice to carry the coal away. Thus far no counters have been driven to cut off the rooms at the point where the roll or

saddle begins to render the inclination inadequate for transferring the coal by gravity, but roads are being driven over the saddle and down into the dip beyond it, so that the coal may be removed in these places, for some of it is too difficult to reach by buggies operating in an extension of the chambers.

All the workings are ventilated by an 8-ft. Jeffrey centrifugal fan which provides 100,000 cu.ft. per minute at a 2-in. water gage. In the winter about 175 men are employed underground working in three shifts, or about 58 men per shift. Hence, the quantity of air per man is about 1,720 cu.ft. per minute, which is certainly a generous allowance. The mine, though shallow, produces a large quantity of gas, and all arrangements to prevent an explosion are as liberal as the air allowance would indicate. No booster fans are used but some auxiliary ventilators. Inspection for gas is made with the methane indicators of the Union Carbide & Carbon Corporation, which register up to 7 per cent and will show the methane content within 0.05 per cent. The management reports that they give reliable data without adjustment.

Fire Protection Provided

In order to protect the mine against fires, which would work havoc in such heavily timbered workings, water lines are taken to the face of each gangway. These lines are used to allay dust and to afford fire protection. Apparently the roof is quite resistant to the passage of both gas and water. In fact, the coal is dry and after mining quite dusty. Where water fails to enter measures, seams are likely to contain a large quantity of methane. Water is removed from the mine by a 500-gal.-per-minute automatic pump which runs for about 20 minutes every four hours. Of course, this does not include the water taken from the Salem bed, which is not working. Probably 60,000 gal. is removed every 24 hours. From the Salem bed 600 gal. can be pumped per minute during the double-shift operation of the washer without greatly lowering the water level. The water in the Salem Hill mine is alkaline and gives little trouble from corrosion.

Rock tunnels which are driven through sand-slate and sandstone are advanced at an average speed of 8½ ft. per day, double shift, using the Sullivan hoe scraper with a loading boom, or rock slide, up which the rock is carried by the scraper and from which it falls into the car (see *Coal Age*, May, 1931, p. 232). Goodman pit-car loaders are used at all gangway faces. All gangways have compressed-air lines delivering air for the compressed-air drills which are operated at those points.

Haulage in the mine gangways is provided by four 6-ton Mancha permissible locomotives and two Atlas standard storage-battery locomotives. Exide and Philco batteries are used. In the last two Mancha locomotives installed, a 49-cell battery is provided; the earlier batteries have only 42 cells.

Charging stations are placed at each level. When the mine is operating as a producing and not solely as a developing unit, batteries are changed as soon as they run down. When the mines are working on development schedule only, the locomotive works with a single battery for a whole day of three shifts, charging whenever opportunity presents. All batteries are brought to their charging stations at the week-end and brought up to standard.

Coal is hoisted up the main slope by a single-drum hoist at a speed of 450 ft. per minute. The slope is equipped with only one track, and two cars are hoisted at one time. Haulage in the main cross-measure tunnel is by 6-ton General Electric and Vulcan trolley locomotives. Roller-bearing American Car & Foundry Co.'s cars are used with end dumps. They have a capacity when loaded of 100 cu.ft. but are normally loaded with 120 cu.ft. of coal. Fourteen of the cars have Tyson bearings.

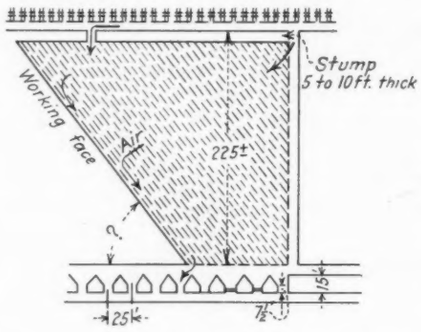


Fig. 4—Future Plan of Operation, Rabbit Hole Seam.

When the mine commenced operations, it was well provided with development, but during the winter most of that development was used up, though, of course, there are many pillars available in the Tunnel bed when it is desirable to use them. The mine worked three shifts during the winter both on development and production; the breaker worked double shift. Today, only one room is producing coal, but all the gangways are being driven three shifts daily, and that schedule will be maintained, except that, in autumn and winter, production from rooms and longwall will be added to development. The breaker runs only a single shift during the summer.

A large quantity of rock from the gangways and tunnels has to be disposed of, and also much rock from the breaker. As the seams pitch, the miners cannot clean their coal but have to load it as it comes. This rock in cars is run to a back switch and hauled by a rope up a steep incline to the top of the hill, where the cars are run onto another car with a revolving dump made by the McCarter Iron Works. This electrically driven car carries the mine wagon to the desired point, when it can be oriented in any direction at pleasure; toggle arms then lift the revolving track on which the mine wagon stands in such a way that the car is tilted about 60 deg. In this way, end fills or side fills may be made without difficulty.

Refuse Problem Important

Refuse from the breaker constitutes a large item in cost of production, as in all steeply pitching mines. In periods of development, 42 per cent of the material received in the breaker goes to the rock dump, and in periods of both coal production and development, 32 per cent of the material has thus to be disposed of. The mine now has 175 cars, but during the winter, when it was producing 1,000 tons on peak operation, only 150 were in commission. Yet 300 cars were dumped at the breaker. This might be interpreted as a turnover of two per day, which, while good for the anthracite region, with its multiplicity of slopes and long hauls, is not so good as would have undoubtedly been obtained if so many cars had not been occupied in taking refuse to the dump, where the long hoist on the slope and the transference to and on the revolving car necessitates further delays. What assists to increase turnover is the triple shift, but here again is another drawback, for the breaker in the winter works only two shifts and the mine three, and there is no storage pocket at the breaker. The cars must absorb the difference. In the development period, tonnage drops to 400 tons daily; the mine works three shifts and the breaker but one. An automatic signal system, installed by the American Mine Door Co., is provided at the tracks leading to the breaker, to prevent interference between trips at that point. This breaker was described in detail in *Coal Age*, March, 1933, pp. 92-93.

Power for the entire colliery is purchased at 23,000 volts from the Pennsylvania Power & Light Co., which has two lines to the premises. The receiving station is owned by the Haddock Mining Co. Here the power is stepped down to 440 volts for use in the breaker. A 2,300-volt line is carried across the river and up the hill to a substation, where it also is stepped down to 440 volts and the power is used for the refuse hoist. It also supplies the entire alternating-current load in the mines and for the fan. A direct-current generator inside the mines supplies current for the trolley locomotives and the refuse dumper.

PRIVATE POWER PLANT

+ Cuts Costs at Kings Station Mine

From Fourteen to Six Cents per Ton

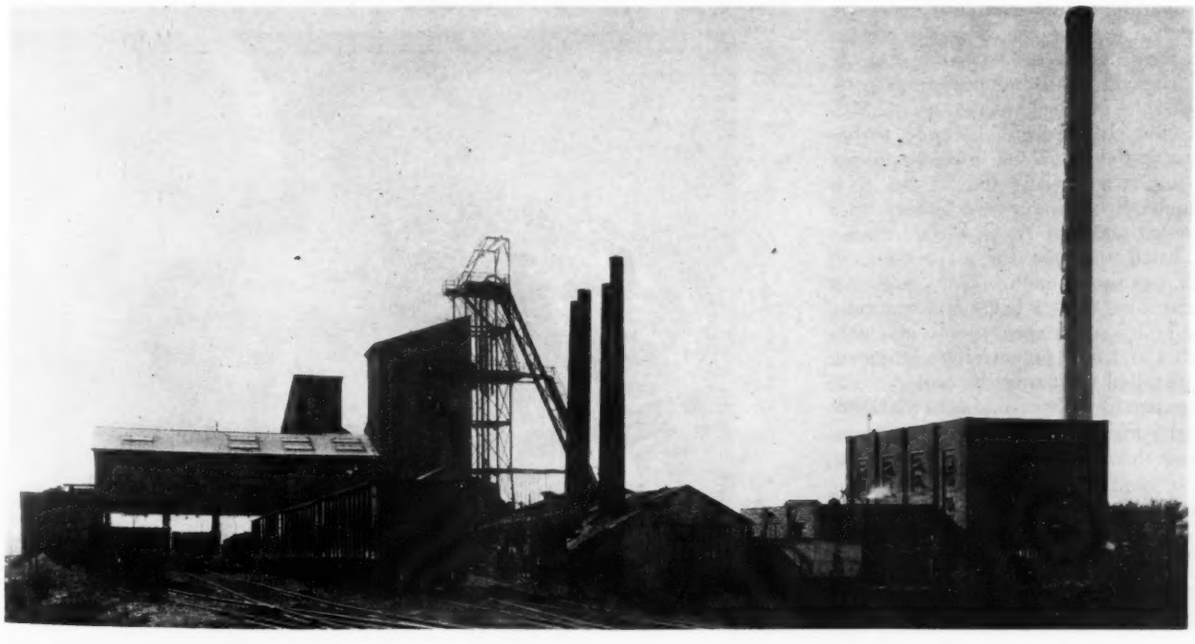
BEFORE MODERNIZATION of the power plant facilities at the Kings Station mine of the Princeton Mining Co. to enable the mine plant to take over the entire power load, power cost per ton of coal hoisted, based on an annual production of 500,000 tons, was approximately 14c. The present cost, including fixed charges on the additional capital expenditure involved in the modernization program, approximates 6c. per ton. The company embarked on its power program late in 1932 and the change-over from central-station service was made July 15, 1933.

POWER, as almost every coal operator readily will admit, is one of the major factors in over-all production cost. Reduced to a per-ton basis, this particular cost item may vary from as little as 3c. where conditions are favorable to economical use to more than 20c. where coal is hoisted and conditions are adverse. Moreover, with increasing mechanization of operations both underground and on the surface, its importance must inevitably grow.

Determination of whether a mine should purchase or generate its power comes down to a question of relative costs. Many coal-mining companies that switched to central-station service during the period of boom demand for coal have not reexamined this question in the light of present-day rates, improvement in equipment and other economic considerations. And many mines that still generate part or all of their power requirements continue to burden themselves with high costs growing out of equipment obsolete many years ago, which quite frequently demands the use of a high-priced, readily marketable coal.

Experience at the Kings Station mine of the Princeton Mining Co., Princeton, Ind., furnishes a case in point. This operation, which has a capacity of 5,000 tons per day, originally was equipped with four hand-fired return-tubular boilers with a nominal rating of 150 hp. each for operating the 28x42-in. twin hoisting

Kings Station Surface Plant. The New Boiler House and Generator Building Appears at the Right. Additions Are Being Made on the Side Facing the Camera.



engine employed to raise the coal out of the 440-ft. shaft—the deepest in Indiana. The plant also supplied steam for the fan engine and for other miscellaneous uses around the surface plant. Fuel was washed egg.

Like many other operations in the Middle West, the Princeton Mining Co. early turned to mechanical loading as one means of coping with the competitive situation, and has since completely mechanized this department—with consequent increase in power consumption. Elaborate preparation equipment and increased electrification of other operations added still more to the load to be carried by purchased power, bringing the total expenditure for energy up to approximately $36,000 in 1932.

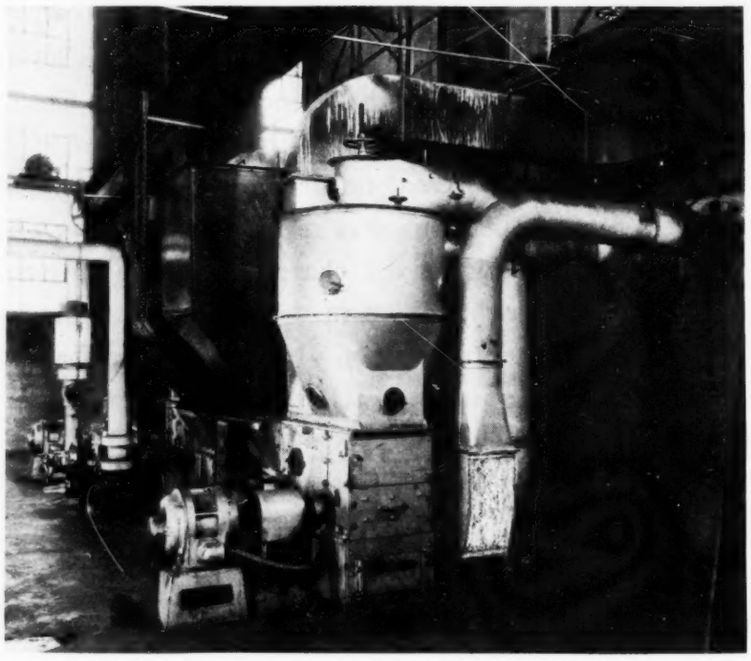
These conditions led the company to embark on a study of the possibilities of generating power at the mine late in that year. This investigation showed that the existing boiler plant was practically obsolete, in a bad state of repair and was too small to handle the increasing load, making installation of more hand-fired units or complete rebuilding of the plant necessary if the increasing load was to be handled with mine-generated power. Peak demand at that time was 800 kw. and the average was approximately 500 kw. when the mine was in operation. The analysis also developed the fact that the hoisting engine used almost enough steam to fill the average mine power requirements provided the exhaust was employed to operate a low-pressure turbine. Such a tie-up promised low-cost power generation.

Under these conditions it was decided that if a power plant were installed it preferably should include two 1,250-kva. (1,000 kw. at 80 per cent power-factor) turbo-generator units, one a straight condensing unit operating on high-pressure steam and the other a mixed-pressure type for either high- or low-pressure operation, thus enabling it to use the exhaust from the hoisting engine when that equipment was in operation. The program finally adopted, therefore, included the purchase of two used 2,300-volt, 60-cycle General Electric turbo-generators, one of the mixed-pressure type, and two second-hand 500-hp. B. & W. double-drum water-tube boilers, with air-cooled walls of A. P. Green aluminum brick, suitable for a pressure of 200 lb. per square inch. This equipment was installed in new brick and concrete-block buildings, a spray pond was constructed and new pulverizing equipment was installed for firing the boilers. The total expenditure approximated $100,000.

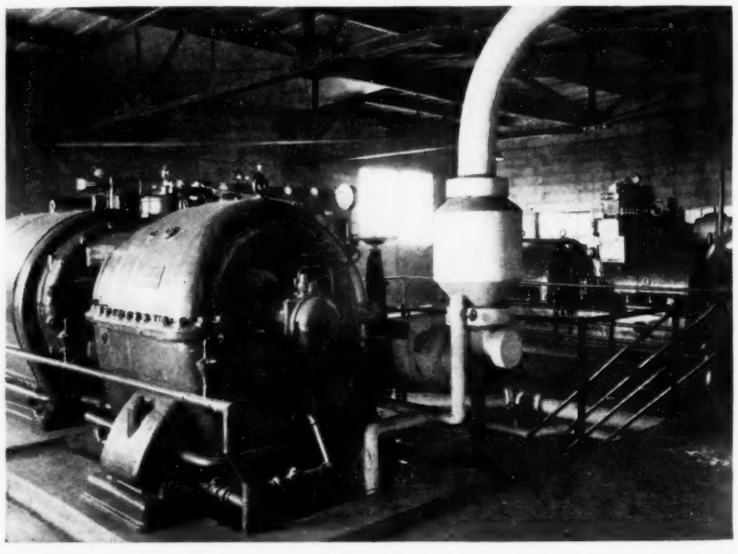
Fuel consists of a low-value material passing through a ⅛-in. screen opening, and is obtained from the rescreening plant. Examination of the fuel, which averages about 11½ per cent ash, and the equipment available for burning it, indicated that it could be used successfully only if pulverized. Consequently, one steam-driven and two motor-driven Unipulvo pulverizing units were installed. These are arranged so that one or two can be used with a single boiler. The steam-driven pulverizer serves as a standby when the current is interrupted for any reason, as central-station service was discontinued when the modernization program was completed. Also, the steam-driven unit, operating on steam from the old boiler plant, is available for restarting after a complete shutdown. While the coal as delivered to the pulverizers is not very wet, these units are supplied with preheated air from the air-cooled furnace walls, which further reduces the moisture content. Nominal capacity of the pulverizer units is 1 ton per hour, although materially higher ratings have been achieved in practice.

A superheat of approximately 150 deg. is carried, and steam is delivered to the high-pressure turbo-generator unit (also the mixed-pressure unit when operating on high pressures), the hoist and other equipment at 160 lb. per square inch. The exhaust from the hoisting engine, which varies from 9 lb. positive pressure to 5 in. of vacuum, is conducted to an accumulator, which delivers steam at an average pressure of 4 to 5 lb. per square inch to the mixed-pressure unit. At this pressure, the unit will deliver approximately

(Turn to page 274)



Fire Room in the Kings Station Power Plant, Showing Original Pulverized-Coal-Firing Equipment



Original Turbo-Generator Units at the Kings Station Power Plant; Mixed-Pressure Unit in the Background.

CRUSHING TECHNIQUE

+ Gains Increasing Importance

With Shift to Smaller Sizes

ALTHOUGH crushing is becoming an increasingly important adjunct to modern bituminous coal preparation methods and as such may ultimately be expected to yield a commensurate return, present practices in the main appear to be based neither on a clear conception of the ends to be attained nor on a well-grounded understanding of the best means to be employed to reach those objectives. While there are more than a few notable individual exceptions, for the most part crushing is too generally regarded merely as an added operating expense which results in a reduction in sales realization through the conversion of high-priced large sizes of coal into cheaper smaller sizes. Such a view, overlooks both the fact that sales value, being contingent upon demand, is, after all, only relative and that added costs incurred in meeting special consumer requirements in size or quality eventually should be returned in full, sweetened with a margin of profit.

Influence of size on sales already finds practical recognition in the bituminous coal industry in the meticulous care which far-sighted producers exercise in screening practices. This is further illustrated in the recent trend toward the erection of rescreening plants for salvaging size values from slack; in the removal of certain percentages of fine coal in "custom preparations" of slack and in the introduction of the dedusting or aspiration process for the elimination of troublesome fines. But extended observation and inquiry have disclosed no paralleling recognition of the importance of using equal exactness in the crushing of bituminous coal.

Crushing at bituminous plants is largely bound up with the trend toward smaller sizes—a trend which is being accelerated by the increasing use of both industrial and domestic stokers; growing interest in pulverized-coal firing, which makes it profitable, for example, to screen out the minus $\frac{3}{8}$-in. product from $\frac{3}{4}$-in. slack and market the coarser coal for stoker purposes and the finer resultant to consumers with pulverized-fuel equipment; and with the conversion of raw coal into manufactured fuels. The stoker, however, promises to furnish the chief demand for the smaller sizes for a number of years, and, because natural fragmentation cannot be relied upon to yield a sufficient quantity during periods of low general demand for tonnage, crushing as an operating practice must grow in prominence.

With such growth will come a better understanding of principles now more or less hidden. In addition to augmenting a mine's natural output of smaller sizes, crushing also is playing an increasingly important rôle in the recovery of coal values from otherwise unsalable material, functioning either as a cleaner in its own right (as in the case of the rotary breaker) or as a means of releasing coal for later recovery by hand or mechanical methods. Reduction of oversize material in the raw mine-run is still another function performed by the crusher at a number of bituminous operations.

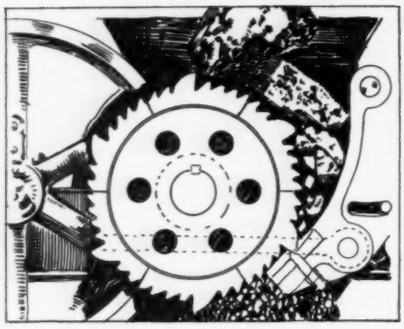
Exactness in crushing is as necessary as accuracy in sizing if undue loss of values is to be prevented or if the coal is to be shipped without further screening. Steam-plant operation exemplifies the necessity for crushing as closely as possibly to a predetermined size if the coal is not subjected to further screening after it leaves the crusher, as coal sized to meet the needs of a steam plant will give an appreciably greater efficiency by minimizing fuel losses in stoker firing. Large modern industrial steam plants have been exhausting these possibilities with little help from the coal producer, but in moderate- and small-sized plants opportunities for improvement still remain; these unexplored possibilities may open the way for alert producers to build up a premium market through close size control.

Ashpit loss of combustible carbon is the most readily controllable of all combustion wastes in stoker operation. This loss, incidentally, is closely allied to that arising from excess air, since neither can be reduced profitably at the expense of the other. In either case, the determinant is the size character-

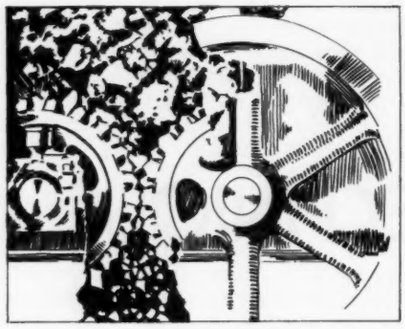
No Man's Land

No one realizes more than the author of this series that no analysis of the subject based on existing available data can fully meet the requirements of the engineer who desires to install crushing equipment. The purpose of this study is to assemble the latest theories, practices and opinions and combine them with others previously recorded. Surprisingly little on the subject is to be found in existing technical literature. Study of manufacturers' literature prompted many questions and these and others growing out of data available were directed to operating men, manufacturers' engineers and large coal consumers. The opinions thus obtained were quite contradictory, making the task of arriving at definite conclusions in some directions impossible. For this reason, the present study is offered merely as a basis for the research which the industry at large should make into the field of coal crushing.

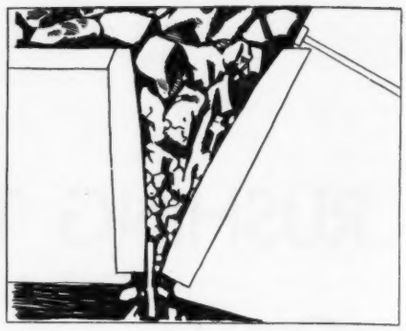
[1]Inquiry as to equipment installed at 39 new preparation plants at commercial bituminous mines revealed that 29 installations included coal-crushing equipment. Twenty of these 29 plants crushed their coal preparatory to cleaning; 13 of the 20 also were prepared to crush the coal for the purpose of augmenting the supply of small sizes.



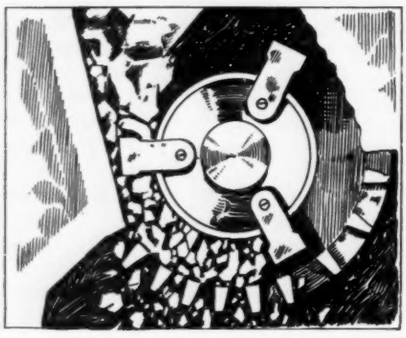
Single-Roll Crusher



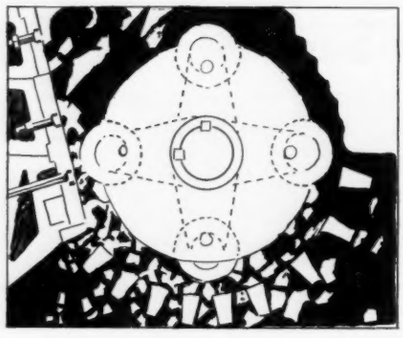
Double-Roll Crusher



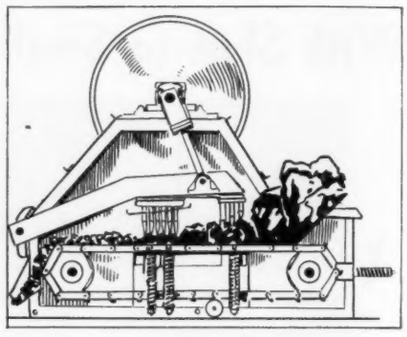
Jaw Crusher



Swing-Hammer Crusher



Ring Crusher

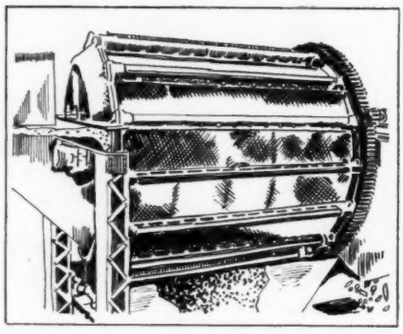


Vertical-Pick Breaker

istics of the fuel. Coal too large for a given feed will pass through to the ashpit before it has been completely consumed; coal that is too small will fall through the grates or burn out in spots and thus admit excess air. An excess of fine material will aggravate slagging tendencies.

Best practice in stoker operation requires that the coal be of uniform texture rather than of fixed density. As here used, "uniform texture" means uniformity of sizes with a minimum of segregation at the stoker. The limits of coal density (weight for a unit volume) is sought only within more or less flexible limits. What the standards should be for a particular power plant can be developed only by experience and experiment; therein lies an opportunity for the employment of a combustion engineering representative by the coal company to determine the best crushing, sizing and mixing practices from the standpoint of both the producer and the consumer.

Roll crushers incorporating the typical spring-relief mechanism invariably yield some oversize. Where a size rating is given for one of these units, that rating seldom guarantees under 10 per cent oversize even when the unit is adjusted to the exact setting for which it has been designed. On the other hand, experience has demonstrated that for a given boiler output each per cent of coal larger than the upper limit to which the stoker has been set adds to the ashpit loss. Attempting to adjust the upper limits of the stoker to the oversize in the fuel only results in other



Rotary Breaker

losses to the ashpit and to an excess of air where there is an undue percentage of fines. Moreover, the proportions of sizes between these limits may have a direct effect on the distribution of air through the fuel bed.

These are some of the reasons why, even when crushed coal is not screened, the relation between the crusher adjustment and the product yield should be closely studied. The next step beyond simple crushing is to screen out the oversize for recrushing. Screening both before and after crushing is a further step in the direction of a better stoker fuel. Screening and mixing according to formula is the ultimate step. The practical limitations on the extent to which refinements in stoker-coal preparation should be carried must depend, of course, upon the characteristics of the customer's plant and upon his willingness to pay for size quality. The ultimate objective in preparing coal is to get the maximum size value out of the mine-run; attainment of that objective means giving the customer the most for his money and the operator the highest average realization from his sales.

High thermal value, relative freedom from extraneous ash, high fusing point, uniform ash or even close sizing are not the sole determinants of quality. Incorrect combinations of sizes can lessen the benefits derived from any or all of these characteristics.

Were it not for the high overhead and operating costs involved in the use of elaborate crushing equipment on the one hand and the functional limitations of low-cost crushing equipment on the other, selection of crushing equipment would be a simple undertaking. Elaborate equipment decreases the coal handled per unit and thereby increases the expense in proportion—in some cases to a level higher than the increases in sales realization will absorb. The goal should be to provide such equipment as will yield results as close to the theoretical ideal as possible without increasing investment beyond the point where it will earn a profit. This resolves itself into getting the most out of each unit, not only in tonnage but in conformity to size specifications.

Search of available technical literature reveals little on the theory and practical fundamentals of bituminous crushing. The anthracite branch of the industry has been studying the crushing problem for years (see *Coal Age*, Vol. 32, pp. 146, 201, 327) and has developed charts which show the product to be

expected with certain roll sizes, centers and speeds. Unfortunately, these cannot be applied to bituminous because of structural differences in the coals. Rock and ore-mining engineers also have their data, but these too are inapplicable, although these studies do serve as indications of the work which should be done for determining suitable practice in the crushing of soft coal. Luckily, there is specific knowledge which might be used as a basis for further study, but most of this knowledge has been hidden away in the designing rooms and sales-engineering offices of the manufacturers.

In crushing, coal is broken down in one of several ways, depending upon the mechanical characteristics of the particular machine employed. With the jaw crusher, which is seldom used for coal, the reduction is largely effected by a squeezing action. In the swing-hammer and ring-mill crushers, reduction takes place chiefly as the result of impact and splitting action; the coal is struck by rapidly swinging arms or rings while it is more or less in suspension. Some degree of abrasion also is present with these types of equipment. Another type of impact machine is the rotary breaker, which breaks the coal by lifting it and dropping it in a revolving cylindrical screen; with this equipment the coal also is exposed to some attritive action.

The single-roll crusher acts on coal by impact, squeezing and abrasion. In the double-roll crusher, reduction results from impact and squeezing; these actions are more nearly instantaneous than in the single-roll machine. Crushers depending primarily upon grinding or attrition are rarely used at coal-mine plants. The vertical-pick breaker, a recent development in United States practice, accomplishes reduction through the piercing action of pointed picks splitting the coal as it is carried through the machine on a conveyor or over a screen.

No two of the types of crushing machines mentioned possess exactly the same characteristics, although no one type has a monopoly on any one reducing action. Since this is so, it seems a fair assumption that there must be a difference in results as between these types and that, therefore, each type must be best fitted for one particular application. With claims made for each, however, that elevate each type to a position of solitary eminence and relegate all others to a level of mediocre performance, confusion in the minds of purchasers and prospective buyers is only natural.[2] This situation is unfortunate because it obscures the fact that certain claims of superior merit may be justified even when such claims are frankly qualified by a statement of limitations. Because of these conditions, no recommendations as to the selection of types of crushers for specific requirements have been attempted in this article.

Research Needed

A concerted research program should be undertaken jointly by the bituminous industry and the manufacturers of equipment to establish basic principles and to bring order out of the confusion of opinion now existing on the subject of bituminous coal crushing. The objectives of this co-operative research program should include not only the classification of crusher types according to size yield but also the determination of the best practices in crusher operation. The continued shift to the smaller sizes of coal and the assurance of a reward make the need for such a study more urgent.

So many variables enter into the selection of a crusher that it is difficult to set up any specifications with anything like general application. Important among the factors to be considered are:

1. The nature of the coal, its hardness and structure.
2. The size of the lumps to be crushed.
3. The size to which the coal is to be reduced.
4. The limits beyond which oversize and undersize are objectionable.

If adjustability to produce a range of sizes is desired, it should be borne in mind that the percentage of oversize and undersize will be at a minimum at the setting for which the crusher is designed and that equal results should not be anticipated for all settings. If certain definite results are expected, a sample of the coal should be submitted to the manufacturer as a guide, but the buyer must remember that no performance guarantee can extend beyond "as new" condition.

A single-roll crusher is simpler and costs less than a two-roll unit of equal capacity. It occupies less space, but consumes more power because of the frictional load set up by the abrasive action. For a given roll diameter, it will accept larger lumps because the angle of nip is greater, and, consequently, it will effect a greater size reduction. Oversize can be minimized but not entirely avoided in crushers incorporating a spring-relief mechanism. Roll crushers have this arrangement and so do the hammer- and ring-type crushers, but the two latter types also are provided with a screen which retains the coal until it has been broken sufficiently to pass through the openings. As this screen is of the bar type, however, it does not altogether prevent the escape of oversize material.

By reason of the screening action peculiar to its design, the rotary breaker is the only type of crusher that yields no oversize. Although popularly identified with the separation of impurities such as rock, bone and sulphur from coal and with the removal of wood and tramp iron, the rotary breaker also has a number of direct crushing applications. Improperly designed, however, the rotary breaker will produce an excessive quantity of fines. The greater the breaker diameter the greater the first cost. This has led in some instances to a reduction in diameter in order to reduce the capital outlay; where this has been done, sufficient screen surface has been provided by lengthening the machine. As a result, the height of drop is insufficient to break the coal in a few falls and the necessary additional tumbling increases the output of fines. Clogging also may be encountered where the fine screen perforations are made too small to pass readily the extremely wet slack sometimes handled.

The tendency generally is to underestimate rather than overestimate the capacity requirements of a crusher. Correct preparation design does not often allow or provide for the installation of a second crusher to augment the capacity inadequacies of the original unit. Where inadequacies occur, there usually is only one solution: replace the unit with a larger one. But that is found to be expensive. The crusher selected in the first place, therefore, should have a greater capacity than that indicated by immediate demand, unless reasonably certain future requirements will not exceed the current maximum.

Structural properties of a coal and its hardness have a bearing on crusher capacity and on the possible size reduction ratio. High moisture content in the coal tends to lower the crusher capacity and also to change the size characteristics with respect to dry coal; the finer the crushing the greater will be the degree of these differences.

[2] Some idea of the absence of any crystallized opinion as to the place of individual types of crushing equipment can be gleaned from the following statements, many of them diametrically opposed, made to the author:

"The product of the single-roll type is notably more uniform and there is less oversize, fewer slabs and a minimum of fines—in sharp contrast to the performance of the double-roll type."

"Where uniform sizing is not required and the percentage of fines is not important, the single-roll crusher will do a satisfactory job."

"The single-roll crusher has a distinct advantage over the double-roll type in that it is capable of reducing mine-run coal to 1-in. and under in a single operation."

"A single-roll crusher should not be expected to produce a satisfactory product less than 1¼-in."

"The two-roll unit will crush to a smaller size than the single-roll machine."

"To crush coal to a small size—say, ¾-in. or less—with the percentage of fines not important, the hammer or ring-type crusher will be found satisfactory."

"The swing-hammer crusher splits the coal to a more uniform product with least dust and little or no oversize."

"Where the percentage of fines is not disturbing and accurate sizing is required, the rotary machine is a good one to use."

"The rotary breaker has the advantage in that, by being continuously screened, the coal is subjected to little attritive action and hence produces less fines under 20-mesh than roll crushers."

FACE PREPARATION

+ Shares Honors With Safety

At Indiana Institute Meeting

LATEST developments in face preparation for efficiency and greater production of lump shared honors with safety in mines at the summer meeting of the Indiana Coal Mining Institute, held at Harmony Park, Vincennes, Ind., June 2. James White, superintendent Peabody Coal Co., Sullivan, Ind., and president of the institute, presided at the two technical sessions, assisted by Harvey Cartwright, Terre Haute, secretary.

With "air shooting" the shock of explosives is replaced "by an expanding or wedging action, slowly applied, but with power sufficient to provide good loading preparation," declared C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri, St. Louis, Mo., in a discussion of various systems of air mining. "Air under high pressure finds the lines of least resistance through the coal, which are the natural cleavage planes," thus increasing lump and decreasing fines, while shooting, in addition to the shattering effect of the blast, leaves the coal in "a highly fractured and broken condition" and therefore susceptible to further degradation during subsequent handling operations.

Equipment for air shooting consists essentially of a compressor and a supply of cartridges, and the air-mining cycle requires but one or two men. With the exception of a change in the size of the hole, which may influence drilling practice somewhat, face preparation methods are the same. One of the major advantages of air shooting, declared Mr. Sandoe, in addition to its effect on production of large coal, is the increased safety made possible through elimination of transportation hazards, fire and its accompanying evils and obnoxious gases and fumes, in addition to better roof conditions.

Echoing Mr. Sandoe's remarks on the safety features, S. E. Skinner, superintendent, Wheatland (Ind.) mine, Standard Coal Co., expressed the opinion that the experimental work with air-shooting equipment at that mine promised excellent results. The Wheatland unit employs valve-type cartridges, and by varying the pressure, said Mr. Skinner, it may be possible to make "any grade of coal that is wanted."

Revisions in face preparation methods to increase the output of mechanical loaders, reduce injuries, cut blasting costs and raise the percentage of large coal were detailed by S. M. Cassidy, superintendent, Saxton Coal Mining Co., Terre Haute, Ind. Results included a reduction of 1c. per ton in blasting cost and an increase of approximately 3c. per ton in sales realization.

Operations are carried on in the Indiana No. 4 seam, with an average thickness of 5 ft. 1 in. Production of the mine, in the Clinton district, is 2,300 tons per day. The roof is a fair grade of gray shale and the floor is hard fireclay. The coal is distinguished by a rather friable, laminated, but woody structure, the 8 to 12 in. next to the roof being softer than the rest of the seam, while the bottom half carries the characteristic 1- to 2-in. "blue band" and usually one or two other hard streaks. Room and entry width are limited to 21 and 11 ft., respectively, because of roof and water conditions. Rooms originally were turned at an angle of 90 deg. with the entries, but experimental shooting showed that driving on the face would give better shooting results with less powder, with the result that the angle was changed to 45 deg. This also facilitates haulage and the movement of track-mounted loading and cutting machines.

Loading and cutting equipment is all track-mounted and consists of the following: two Whaley loaders in entry development, six Jeffrey 44-D loaders in rooms and four Jeffrey combination cutting and shearing machines. Cuts are made with 9-ft. bars, which would be out of proportion for a 5-ft. seam if it were not for shearing. Snubbing would give results equal to shearing in producing lump coal and falls that the loading machines could handle when making such a deep cut, but would be more costly in view of the fact that shearing requires only 3 to 5 minutes' extra time over cutting.

Experimental shooting proved that removing the bug dust increased the per-shift production of the loaders and reduced maintenance costs, Mr. Cassidy declared. Holes are placed by post-type electric drills operated by one man supplied with a push truck. Formerly, the driller not only put in the holes but carried all the explosives on the drill truck and did the tamping. The hazards inherent in this practice, as well as the fact that driller was so rushed that he was unable to give proper attention to the work, caused its abandonment, and now all explosives are handled by shotfirers equipped with special large knapsacks and insulated wooden boxes for carrying the permissible powder and caps, and with solid wooden bars for tamping. The driller still scrapes the holes and leaves the necessary number of dummies for each place. Dummies made from a sand-clay material obtained on the surface or from cuttings from rolls have been substituted for the bug-dust dummies formerly used to increase safety and better shooting results.

The possibility of injuries growing out of men being caught in thread bars has resulted in the establishment of a rule that no holes shall be started unless someone else able to stop the drill (usually the duster) is present. This rule has been instrumental in saving two men from serious injury or death in the past year. Experiments also are being conducted with a new attachment that guards both the thread bar and boxing.

Drilling and shooting methods have been standardized (see Figs. 1 and 2) and blasting is done with Duobel No. 4, $1\frac{1}{4}$x6 in. All places are shot with magneto-type blasting machines after the regular shift ends. This method is more positive and safer than fuse and

caps, said Mr. Cassidy, reduces smoke and will not ignite gas. Electric detonators with 10-ft. wires and Wilson shunts cost about 7½c. per hole, against 8.1c. per hole with a 10-ft. fuse and cap.

For several months prior to the adoption of the new face-preparation program, shooting cost (including powder, caps, fuse and tamping bags) averaged 3½c. per ton with practically no narrow work. In the year since the adoption of the program, the cost has been 2½c. per ton, 30 per cent of the tonnage coming from development sections. Entries also have been yielding large lump with an explosive cost little, if any, higher than in rooms. Mr. Cassidy explained this as the result of better proportioned shots and the ability of the entry machines to load better lump. In addition, the output of minus 2-in. coal has been reduced approximately 7 per cent. Assuming a difference of 50c. per ton between plus and minus 2-in. coal, the increase in realization on the daily output of 2,300 tons is 3c. per ton. The proportion of fine sizes is now approximately the same as in hand loading.

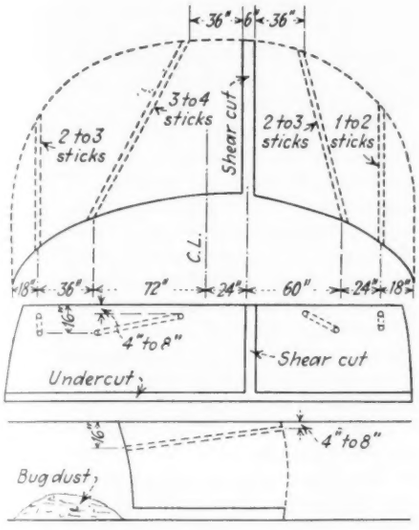


Fig. 1 — Standard Plan of Drilling and Shooting in 21-Ft. Rooms. Not Over Ten Sticks (3.47 Lb.) Per Room, Giving 34 Tons of Coal.

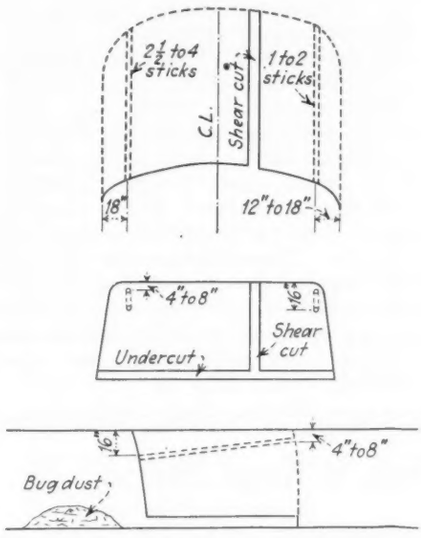


Fig. 2 — Standard Plan of Drilling and Shooting in 11-Ft. Entries. Not Over Five Sticks (1.75 Lb.) Per Room, Giving 16 Tons of Coal.

Although all of the improvement cannot be attributed to better face preparation, loading-machine output has been considerably increased by better shooting and the cost of repairs and time lost due to breakdowns has been greatly reduced. Even better lump production would be possible were it not for the fact that the limited space between the loading-boom machine and the roof forced a compromise between larger lumps and greater loader capacity.

Leading the discussion, P. L. Donie, vice-president, Little Betty Mining Corporation, Vincennes, declared that where shearing was practiced at his operation, shooting costs were reduced to approximately the figure cited by Mr. Cassidy. Shooting without shearing increased the cost 1½c. per ton, making the average cost for the mine as a whole 3.4c. per ton. Lump also is increased by shearing.

Double shooting is practiced in the No. 5 seam at the mines of the Knox Consolidated Coal Corporation, said H. G. Conrad, general superintendent, Bicknell, Ind., in relating the development of blasting methods for loading machines. The No. 5 coal is 6½ to 7 ft. thick, and a total of eight holes are used, four in the top and four in the bottom in a 25- to 30-ft. place, using snubbing pans. The bottom holes are loaded with the slowest permissible powder, the bug dust first being removed and the pans inserted. No snubbing is done in the No. 5 seam (4½ ft.), only the dust being removed. All shooting is done at night.

Introducing the subject of the influence of bit treatment on tonnage cut, John A. Garcia, Allen & Garcia Co., Chicago, cited the following performance figures: "Coalmaster," 7.2 tons per bit; standard type, 2 tons; standard, heat-treated, 4 tons; Bowdil, 12 tons. Heat-treating has cut bit consumption at the Dresser mine of Walter Bledsoe & Co. 50 per cent in the past 1½ years, said H. A. Cross, superintendent, Terre Haute. Hard cutting is the rule.

At the No. 48 mine of the Peabody Coal Co., Sullivan, Ind., bits are now oil-tempered, said W. G. Burriss, top foreman, with the result that 1,600 to 1,800 bits are required to cut 1,900 tons. Formerly, 3,000 to 3,400 bits were required for 2,000 tons. The bits are heated in a bit heater, forged by a trip hammer, quenched in oil to maximum hardness and then drawn to the proper temper in an oil bath. Bits are forged a little smaller on the back side to insure proper clearance. After experiment, it was found that a temperature of 580 deg. in the tempering bath gave best results in the hard cutting encountered in the No. 4 seam band. Five hundred bits are tempered at once, requiring 15 minutes.

"Without safety, you have no efficiency," was the forthright opinion expressed by Peb G. Conrad, superintendent, Knox Consolidated Coal Corporation, Bicknell, Ind. "Safety is simply doing things the right way, while accidents are caused by carelessness and doing things the wrong way, and result in inefficiency and increased cost."

Prior to July, 1933, he said, the accident record at the Knox Consolidated mines was none too good, although it compared favorably with that of other mines in the State. Management, however, realized that something must be done, and, believing the foremen to be the key men in a safety program, called them in for a discussion of possible safety measures. The next step was to place properties and equipment in a safe condition, after which it was felt proper to enlist the cooperation of the employees. A first informal meeting was held July 8, 1933, and while attendance was small, weekly meetings were scheduled, with growing popularity.

A Joseph A. Holmes safety council was established Sept. 13, 1933, and now has a membership of over 600. Monthly meetings are held to discuss past accidents and safety methods. First-aid

training (15-hour course) has been given to 225 employees and this work is continuing. Safety standards have been adopted and first-aid stations have been established in the various working sections in the several mines, each fully equipped with first-aid material. This has reduced first-aid supply cost 75 per cent. Each injured employee is required to report immediately to the foreman in charge. Bulletin boards and "Accident Thermometer Boards" supply both educational material and a visual record of safety progress.

The use of safety shoes and protective headgear, sold at cost on a convenient deferred payment plan, is encouraged, with the result that 50 per cent of the employees are so protected. The proportion is even higher at the No. 2 mine, where 95 per cent of all employees are so equipped. "Our mines since this campaign are in better physical condition than ever before in our mining experience," declared Mr. Conrad. Costs have decreased and efficiency has increased. And accident frequency and severity rates have been reduced more than 75 per cent.

Coal mining has suffered from the traditional idea that natural hazards make it impossible to achieve safety records comparable to those in other industries, observed Alex Miller, U. S. Bureau of Mines, in opening the discussion. Mr. Miller also agreed with Mr. Conrad that management must first believe in safety before a program can be effective, as did William Cunningham, superintendent, Linton - Summit Coal Co., Terre Haute.

A. G. Wilson, chief, Indiana Division of Mines and Mining, Indianapolis, traced the growth in coal-mine accident cost from $1.40-$1.70 per $100 of payroll in 1907 to $8-$8.50 today, reviewed fatality records in recent years and echoed the stand of previous speakers on management's part in safety. Safety work in late years has been yielding real results, declared M. J. Grogan, Lynch Coal Operators' Reciprocal Association, Terre Haute, with the result that the rise in cost from 3c. per ton in 1918-19 to slightly over 8c. four or five years ago has been checked and prospects for improvement now are pending.

Private Power Plant Cuts Costs at Kings Station

(Concluded from page 268)

four-tenths of the name-plate rating. While higher pressures could be carried in the accumulator, the increased back pressure would adversely affect the operation of the hoisting engine.

As stated in a preceding paragraph, increasing electrical load was one of the major factors in the installation of the Kings Station power plant. This increase has continued, due to the installation of additional loaders, as well as auxiliary equipment to increase their efficiency, and also due to further surface electrification, including the installation of a modern motor-driven fan. Additional loads are contemplated in the future, including the eventual electrification of the hoist and immediate replacement of the 70-ton steam car-shifting locomotive with an electric unit.

As a result of these developments, d.c. substation capacity has been increased to 1,400 kw. to serve the underground equipment, which includes fifteen mechanical loaders of various types (two on rock and two in reserve), sixteen cutting machines and 21 locomotives (three more to be installed in the near future), and the connected a.c. load has increased to 500 hp. Maximum peak demand is now 1,200 kw. and daily energy consumption is 16,000 kw.-hr.

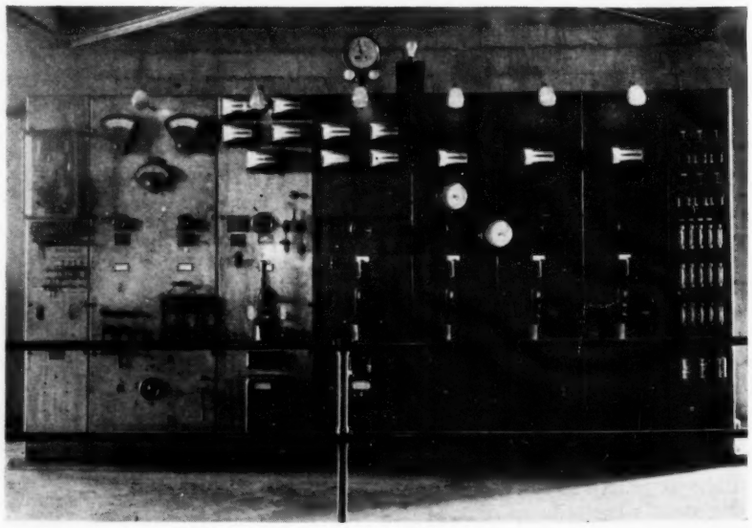
To take care of this increased load the power plant is now being enlarged by the addition of another 500-hp. boiler with water-cooled furnace walls, another pulverized-coal firing unit (Whiting), and an additional 2,000-kw. turbo-generator unit, which normally will serve as a standby. Plans also are under way for converting the air-cooled walls in the existing boiler units to water-cooled walls. This is expected to raise the maximum capacity of each boiler from 1,000 to 1,500 hp. The spray pond has been enlarged to 6,000 g.p.m. to take care of the added condenser capacity necessary. When these additions are completed the total plant investment will be approximately $140,000.

Advantage is taken of three possible sources to insure an adequate water supply: surface drainage to a pond at the plant; a small creek a mile east of the plant, from which the water is pumped to the pond; and three wells. These wells are drilled into a water-bearing gravel stratum about 100 ft. below the surface, and one is fitted with a deep-well pump connecting to the pipe line from the creek. Water from the other two wells is siphoned through auxiliary boreholes down into the mine and along an entry to a pump at the shaft, which elevates it to the surface. Taps on the pipe line in the mine also provide water for sprinkling, fire fighting—if it should become necessary—and other uses. In spite of the severe drought this summer no well water has been needed for the power plant.

Water used in the boilers, regardless of the source, is filtered and treated by the hot lime-and-soda process. Worthington and Ahlberger condensers provide a vacuum of 28 in. Air for the generators is cooled and cleaned in a Bayley washer. Both steam- and electric-driven exciters are provided. Pipes are covered with Armstrong Nonpareil high-pressure insulation. For keeping an accurate check on operation, boiler and accumulator pressures, vacuum, voltage and amperage are recorded graphically.

The plant is operated by one man in the fire room and another in the turbine room under the supervision of a competent technical superintendent. With the old boiler plant, the regular fireman often was compelled to call for additional help to handle the work. Pulverized-coal-firing result has measured up to expectations. Maintenance of the original pulverizing equipment is approximately 6c. per ton pulverized. This is an increase of 1c. over the original estimate, probably due to a somewhat higher ash in the fuel than was expected.

C. M. Garland & Co., consulting power engineers, Chicago, conducted the necessary investigations and designed the Kings Station plant and additions now being installed.



IRONING OUT

+ Difficulties in the Correct Measurement Of Mine Air Pressures

By ROBERT S. LEWIS

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FLUIDS have certain "critical velocities" above which their flow becomes turbulent, so that resistance to their passage greatly increases. In 1883, Prof. Osborn Reynolds, using the apparatus shown in Fig. 1, introduced a filament of red liquid along the axis of a tube through which water was flowing. At low velocities, the colored liquid passed axially through the water, but as the velocity was increased a definite speed was reached at which the red filament began to break up and mix with the water, so that the flow became confused. This critical velocity, V, expressed in feet per second, marked the beginning of the transition from streamline to turbulent flow.

Further experiments indicated that the value V_cD for maximum streamline flow was always constant when D represented the diameter of the tube. He next found that if the fluid was changed, as from water to oil, the product V_cD was not constant, but that the expression $V_cDw \div u$ was constant, where D represents the diameter of the tube in feet, w the weight of the fluid in pounds per cubic foot, and u its viscosity in pounds per foot per second. This expression has been represented by R and is known as Reynolds' number or criterion. The values in Table I are given by Hodgson.

Streamline Flow Unusual

As change from streamline to turbulent flow is transitional, experimenters give different values for Reynolds' criterion, but 2,000 for critical value and 3,000 for the beginning of turbulent flow are satisfactory values to use. From the following data it will be seen that the air-flow velocities which have to be calculated are almost always great enough to cause turbulence. Writing the equation $V_c = 2{,}000u \div Dw$ and substituting weight of air at 60 deg. F., or 0.0762 for w and 0.00001209 for u, the equation becomes $V_c = 0.32 \div D$. For a pipe of 9-in. diameter, $D = 0.75$ ft. and V_c becomes 0.427 ft. per second, or 25.6 ft. per minute.

For a rectangular airway, D is taken as four times the hydraulic mean radius, or four times the area divided by the perimeter. For an airway 6 ft. high and 5 ft. wide, $D = 4 \times 30 \div 22 = 5.45$; consequently $V_c = 0.32 \div 5.45 \times 60 = 3.5$ ft. per minute, assuming that the airway is smooth as the pipe. Thus with any noticeable velocity, the flow of air is turbulent.

In streamline flow, illustrated in Fig. 2, the average velocity of flow in the duct is 0.5 times the maximum flow in the center, but in turbulent flow, as illustrated in Fig. 3, the average flow is 0.81 times that at the center. Such regularity is seldom attained in practice, unless the airway is uniform in section, without curves or other irregularities, and the air is made to enter evenly over the cross-section and with no tendency to rotate or spiral.

Table I—Weight and Viscosity of Air at Different Temperatures

Temperature, Deg. Fahrenheit	Weight of Dry Air 30-In. Barometer Lb. Per Cu.Ft.	Viscosity in Feet Per Second
40	0.07925	0.00001172
50	0.0777	0.00001191
60	0.0762	0.00001209
70	0.0748	0.00001227
80	0.07345	0.00001246
100	0.07080	0.00001283
120	0.06835	0.00001319
140	0.06610	0.00001356

With streamline flow, resistance varies as the first power of velocity, but for turbulent flow the power (n) is about 1.71, increasing to 1.8 or more at high velocities; and for rough pipe, and especially for mine airways, n usually is taken as 2, which explains the Atkinson formula $P = KSV^2 \div A$, in which P = pressure in pounds per square foot, K = coefficient of friction, S = rubbing surface in square feet or perimeter times length, V = velocity in feet per minute and A = area in square feet.

In measuring air flow in ducts, the nature of the source of air must be considered. A blowing fan takes air at atmospheric pressure and raises that pressure enough to overcome frictional resistance and to impart velocity to the air. Hence, static and total pressures in the duct are above atmospheric pressure. An exhaust fan creates a partial vacuum. Hence, these pressures are both below atmospheric pressure. Velocity pressure is always regarded as positive.

How Pressures Are Measured

Figs. 4 and 5 illustrate how pressures are measured by static tubes and total-pressure tubes. With a blowing fan, all the pressures are positive. With an exhaust fan, the total pressure is the sum of the static and velocity pressures, but the static pressure is the greater and is negative, and consequently the total pressure is negative.

If a datum of + 10 in. of water gage be taken in both cases, the equation in Fig. 4 would read $T.P.$ (15 in.) = $S.P.$ (14 in.) + $V.P.$ (1 in.) and in Fig. 5, $T.P.$ (6 in.) = $S.P.$ (5 in.) + $V.P.$ (1 in.) and all pressures would be positive. These figures also illustrate how a pitot tube may be connected to a manometer or water gage. Thus, the total pressure is positive in Fig. 4 as compared with atmospheric, and negative in Fig. 5, so the manometer must be connected accordingly. Static pressures in the two cases likewise change sign, but it will be seen that for measuring velocity pressure the connections are identical.

From Figs. 2 and 3 it is evident that, for either streamline or turbulent flow, if the center velocity could be measured by a pitot tube, this value could be multiplied by the factor 0.5 or 0.81 to give

the mean or average flow in the duct. Usually, because of irregularities in the duct or because of the manner in which air enters it, the flow is more irregular than is shown, and the duct has to be divided into a series of equal areas (concentric for a circular duct and square or rectangular for one of that shape). The velocity at the center of each area is found, and these velocities are then averaged to get the mean velocity of flow. As the velocity in feet per minute $= 1{,}097.5\sqrt{\frac{i}{w}}$, where i = inches of water gage and w is the weight of a cubic foot of air under the given conditions, a better method is to take the square root of i for each area and, after averaging these square roots, to multiply the average by $1{,}097.5 \div \sqrt{w}$.

Drop in Total Pressure

To determine the resistance which a duct offers to the flow of air, the drop in total pressure for a given length of duct is measured (see Figs. 6 and 7). Two similar pitot tubes are connected by equal lengths of rubber tubing to the manometer. If the cross-sections at A and B are the same, the velocity pressures will cancel each other, and the difference in total pressure will be equal to the difference in static pressures, so connections are made to the static outlets of the pitot tubes. This usually simplifies the matter, as the static pressure, and consequently the total pressure, is likely to be more uniform across the section than the velocity pressure. The static pressure generally is assumed to be constant across any section, but because of eddies this is not always true.

If sections A and B are not equal, the differences in velocities at the two sections must be considered in determining total-pressure drop. Accordingly, it may be preferable to measure the velocity of flow at some other section than A and B. In a large airway the section may be lined with boards to give a smooth duct of uniform size for, say, 15 or 20 ft., with approaches sloping outward at not over 7 deg. on either side.

At such a measuring station the air will flow more regularly, and the mean velocity can be measured more accurately than in a rough section of irregular shape. Once the actual quantity of air passing is determined, the mean velocity at sections A and B can be computed from their measured areas. Hence, the difference in velocity pressures (the differential velocity pressure) for the two points can be calculated. If the velocity decreases as the air flows from A to B, the difference in velocity pressures is added to the difference in static pressures to get the drop in mean total pressure. If the velocity increases as the air flows from A to B, subtract the differential velocity pressure from the differential static pressure to get the differential total pressure.

Calculating Friction Coefficient

The coefficient of friction may be determined from the measured drop in total pressure over a given length of airway by the formula:

$$K = \frac{5.2 \times W.G. \times A \times 0.075}{w \times S \times V^2}$$

in which $W.G.$ = inches of water gage. The figure 0.075 is the weight of a cubic foot of air under standard conditions, to which K should always be referred, or otherwise its value would vary as weight of air is changed. Though pressure drop may have been determined for air weighing 0.068 lb. per cubic foot, K should nevertheless be found by the formula after using 0.068 for w.

Conversely, if the pressure drop is to be calculated for a given length of known airway, this formula should be used:

$$P \text{ (lb. per sq.ft.)} = 5.2\ W.G. = \frac{KSV^2w}{A \times 0.075}$$

In measuring the static pressure in an airway near the fan, a straight tube projecting into the airway will commonly give an inaccurately high water-gage reading. A tube with a circular disk (see Fig. 8) will give more accurate results if the face of the disk is parallel to the direction of flow, but readings will be a little high if the fan is exhausting air. A Prandtl-type pitot tube—that is, one with a narrow slot for the static opening—will give the most accurate results if the nose of the tube is pointed directly upstream. It has been recommended that two or more static tubes be used in a given cross-section of airway, so that the average static pressure can be more closely determined.

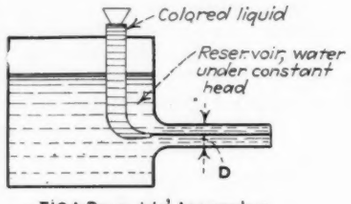


FIG.1-Reynolds' Apparatus

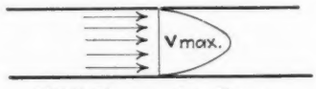


FIG.2-Stream-line Flow

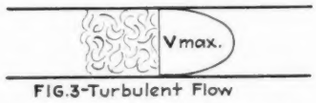
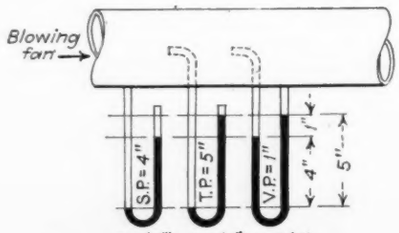
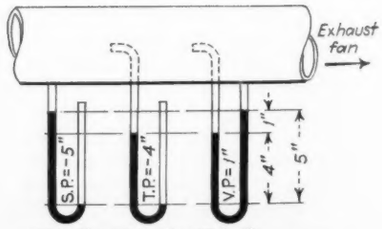


FIG.3-Turbulent Flow



T.P(5") = S.P(4") + V.P(1")
FIG.4-Gage Readings for Blowing Fan



T.P.(-4") = S.P.(-5") + V.P.(+1")
FIG.5-Gage Readings for Exhaust Fan

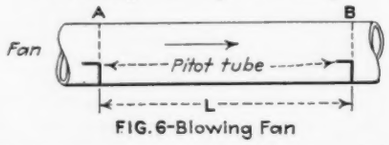


FIG.6-Blowing Fan

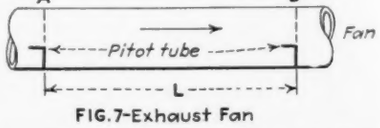


FIG.7-Exhaust Fan

Total-pressure drop = mean T.P. at A - mean T.P. at B
= (S.P. at A + V.P. at A) - (S.P. at B + V.P. at B)
= (S.P. at A - S.P. at B) + (V.P. at A - V.P. at B)

Total-pressure drop = mean T.P. at B - mean T.P. at A
= (S.P. at B - V.P. at B) - (S.P. at A - V.P. at A)
= (S.P. at B - S.P. at A) - (V.P. at B - V.P. at A)

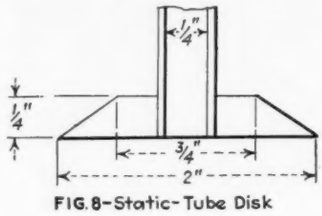


FIG.8-Static-Tube Disk

Illustrating Streamline and Turbulent Flow and Methods of Measuring Air-Current Pressures.

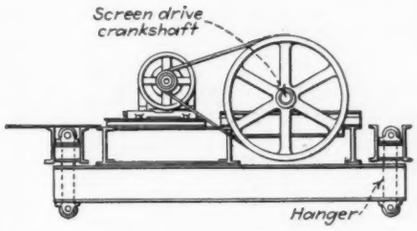
SUSPENDED DRIVE

+ Eliminates Shock From Shakers

At New Consolidation Tipple

LAST November The Consolidation Coal Co. started up at Mine No. 63, Monongah, W. Va., a new "complete tipple" of steel and concrete construction featured by a departure from common practice in the design of main shaker-screen drive to relieve the structure of shock. The success of the new design is indicated by the fact that, although the heavy screens are mounted across the narrow dimension of the tipple and the steel structure of the building is somewhat lighter than standard, it was not necessary to install backlegs to prevent sway.

The mine, which is one of the largest in the Fairmont field, is located on the Baltimore & Ohio R.R. and the Monongahela River about five miles upstream from Fairmont. Equipment replaced by the new plant consisted of a wooden tipple built in 1920. Changed market conditions called for sizes and preparation not possible with the old plant. Instead of adding the required equipment to the existing plant, it was considered more economical to tear it down completely and build to secure every possible advantage in better preparation and lower maintenance cost. Rated capacity of the new plant is 450 tons per hour, and it has been tested to 550 tons per hour with satisfactory results.



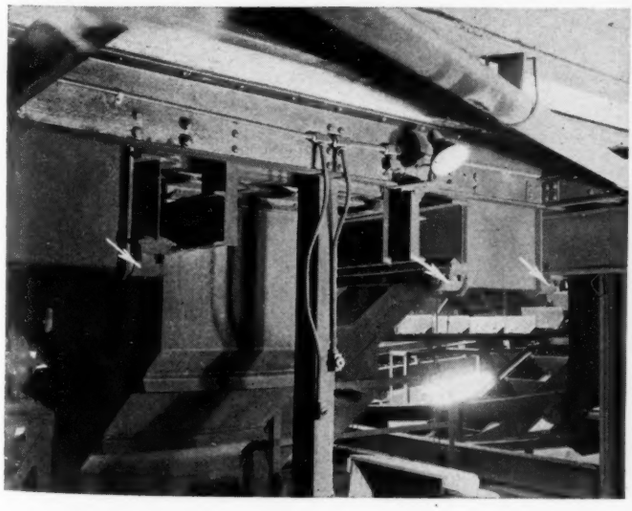
Elevation Showing Suspended Base Supporting Motor and Crankshaft.

Main screens are 8 ft. wide. The upper section weighs 12,250 lb. light and 18,500 lb. with normal coal load. Weight of the lower section is 14,000 lb. light and 17,000 lb. loaded. Thus, when operating empty, the unbalanced "kick" on the crankshaft amounts to 1,750 lb., due to the lower screen being the heavier. With normal coal load, the upper screen has the greater total weight and the kick is 1,500 lb. The degree of unbalance fluctuates through a wide range, due to the starting and stopping conditions existing for short times when only one of the sections may be carrying a load. Other causes for differences in total weights of the sections are changes of screen-plate sizes and rearrangement of gates which change the quantity of coal drawn from the upper screen.

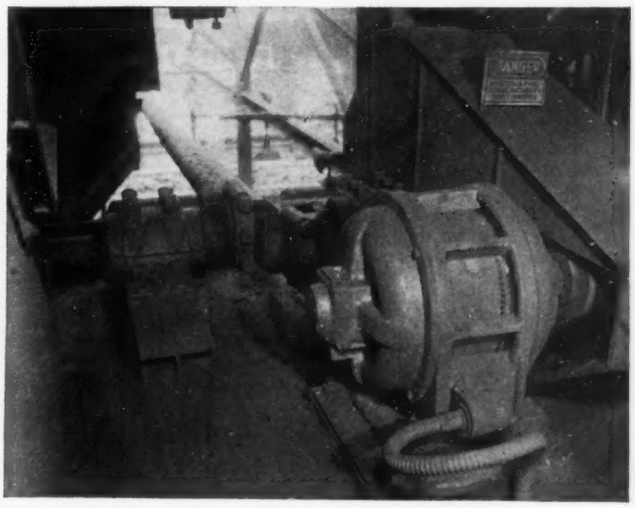
To minimize the shock of the unbalanced kick, the entire drive, consisting of electric motor, V-belt connection and crankshaft, is mounted on a base or platform suspended from the tipple structure and free to swing about 1 in. either way from normal. Inertia of the total weight of platform and drive, together with the action of gravity, opposes the tendency for movement. But during any period when the screen weights are unequal there will be a slight sway of the drive platform in unison with the heavier screen.

Because the drive-unit platform is suspended by four hangers, one at each corner and equipped with axle bearings at each end, the installation is in effect a pendulum and therefore has a natural period of harmonic motion. The length

Arrows Point to Lower Bearings of Platform Hangers Supporting Shaker-Screen Drive.



Motor, V-Belt Drive and Crankshaft Are Mounted on the Suspended Drive Base.



of hangers must be such that the natural period differs materially from the speed of the crankshaft; otherwise, the motion would build up and cause trouble.

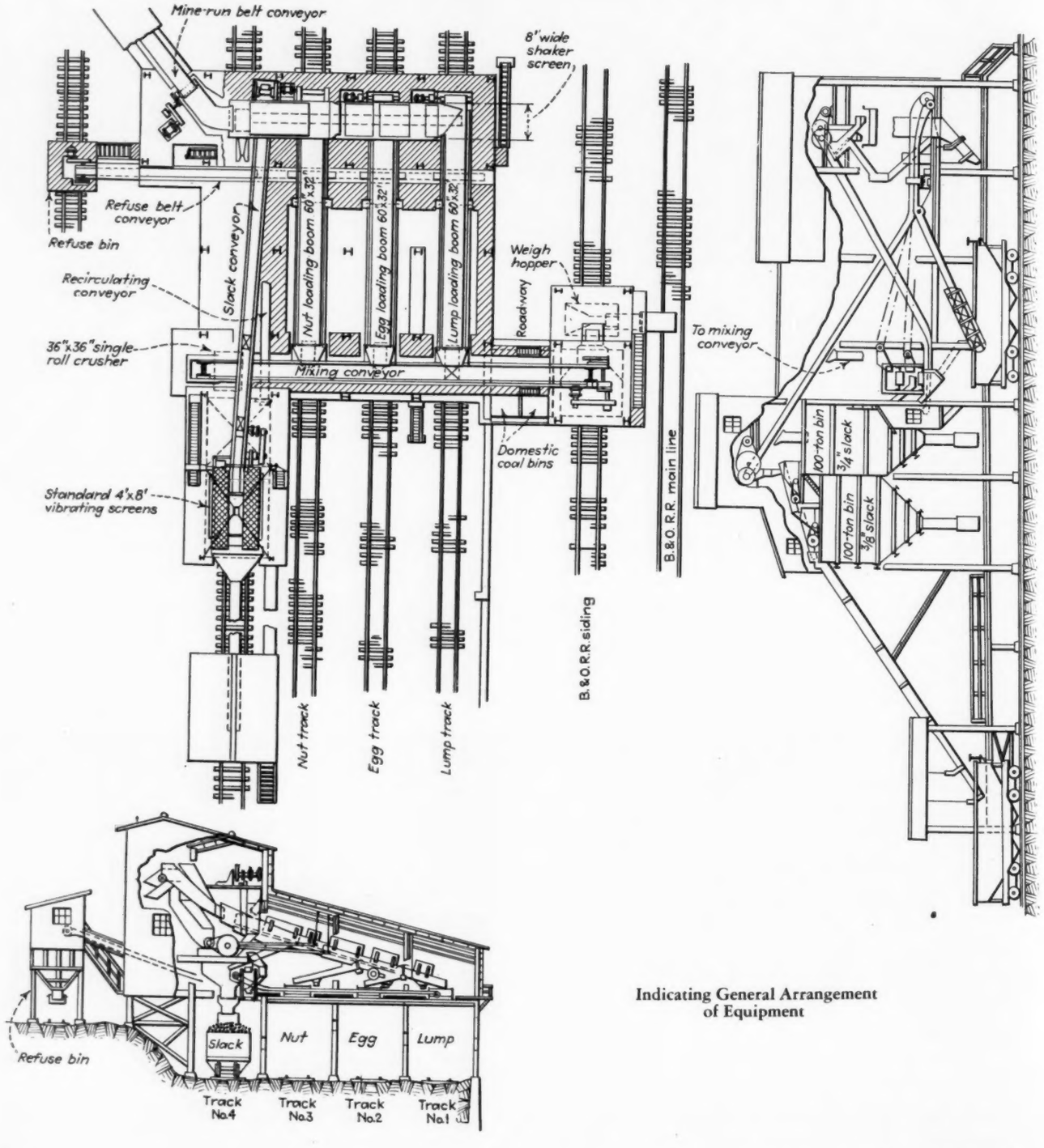
In the Monongah installation the screen-drive crankshaft operates at 120 r.p.m. and the natural period of harmonic motion of the drive unit is approximately 33 cycles per minute. Floor dimensions of the drive platform are 9x13 ft. and the total weight is 30,000 lb. including one-half of the weight of the screen-drive connecting rods. Of the total weight, approximately 12,000 lb. is concrete that was added to increase the inertia. The length of the platform hangers from center to center of axles is 30¾ in.

The crankshaft was designed with an eccentricity greater than that which would have been specified for a drive of the stationary type. Instead of a 2½-in. eccentricity, which would have resulted in screen strokes of 5 in., the eccentricity was made 2¾ in. This is to compensate for a possible drive-unit movement of ¼ in. each way from normal, thus insuring that the stroke of the heavier screen will not be less than 5 in. If the movement amounts to the full ¼ in. from normal, the stroke of the heavier screen will be exactly 5 in. and that of the lighter screen exactly 6 in.

During normal operation the movement has been observed to be somewhat less than ¼ in., and the typical thud, or hammer, of operation of heavy screens is absent. A motor test showed that 13.2 hp. is required to drive the screens when light and 14.6 hp. when they are loaded to an average condition.

This suspended-drive-base arrangement was developed and designed by J. W. Murry, engineer, construction department, Consolidation Coal Co. It is equally applicable to shaker picking

(Turn to page 281)



Indicating General Arrangement of Equipment

ILLINOIS COAL MEN

+ Canvass Safety and Operating Problems

On Annual Boat Trip

SAFETY and operating problems, with particular attention to face preparation, were the major topics of discussion at the summer meeting of the Illinois Mining Institute, held in conjunction with the sixteenth annual boat trip on the Str. "Cape Girardeau," June 8-10. At the business session, members approved a project to award $350 in prizes for the best essays submitted by fifth- to eighth-grade pupils in coal-mining districts on "Why Should Coal Miners Be Interested in Safety?" The contest is to be conducted by the National Safety Council working with an institute committee. A motion for the appointment of a committee to continue investigation into the possibility of establishing a scholarship or research fellowship at the University of Illinois also was approved. Technical sessions were presided over by Charles F. Hamilton, vice-president, Pyramid Coal Corporation, Chicago, and C. J. Sandoe, vice-president, West Virginia Coal Co. of Missouri, St. Louis, Mo.

When labor recognizes and takes seriously the fact that the happiness of the individual as well as the welfare of his fellow employees is at stake, "we may anticipate another step forward toward the minimizing of causes, as well as a lowering numerically of the number, of accidents, whether or not they be of a serious nature," declared W. J. Jenkins, president, Consolidated Coal Co. of St. Louis, St. Louis, Mo., in discussing the question of bringing home to labor its responsibility in the prevention of accidents. In the absence of Mr. Jenkins, his paper was presented by Fred S. Wilkie, secretary, Illinois Coal Operators' Association. Such recognition, however, must be accompanied by intelligent, daily direction of the working force by the supervisory staff if maximum results are to be attained.

The operator is charged with the responsibility of determining accurately and impartially: (1) the cause of an accident; (2) whether an ample supply and proper use of material would have prevented it; (3) whether the employee was qualified mentally, as well as physically, for the particular task he was engaged in; (4) whether the accident was due to non-observance of safety rules; and (5) whether the injured employee knew the rules. Reports of accidents at mines of the Consolidated Coal Co. of St. Louis go directly to the president, and must supply answers to the last four questions as a basis for the elimination of further accidents of the same type.

From Jan. 1, 1927, to date, fatalities underground totaled 3 at the Herrin No. 7 mine and 8 at the Mt. Olive No. 15 mine. An additional fatal occurred on the surface at No. 7, due to a bursting throttle valve, bringing the total up 4. With the exception of the surface fatal, practically all of these deaths might have been avoided had the principles outlined been in effect, Mr. Jenkins felt. The surface fatal was believed to have been unavoidable. Table I shows the fatalities underground by causes and occupations. Table II shows the record for non-fatal injuries during the same period.

"Contrary to the earlier views of many, the introduction of mechanical-loading devices has resulted in a large volume of mined tonnage per compensable accident, as compared with hand-loading methods," Mr. Jenkins declared. Results at the Consolidated mines are shown in Tables III and IV, and include cutting, drilling, shooting,

Table I—Fatalities at Mines of the Consolidated Coal Co. of St. Louis Since Jan. 1, 1927, by Causes and Occupations

	Mine No. 7, Herrin	Mine No. 15, Mt. Olive
Production, tons	2,113,612	5,204,862
Fatalities, underground	3	8
Surface (bursting throttle valve)	1	.....
Fatalities Due to Falls of Various Types Underground		
Top coal	1	.....
Face	.....	2
Slate	.....	4
Total	1	6
Occupations of Men Killed by Falls Underground		
Certified miners making places safe (mechanical loading)	1	3
Certified miners, hand loading	.....	1
Cutter operators	.....	1
Cutter helpers	.....	1
Total	1	6
Miscellaneous Underground Fatalities		
Tripper	1	.....
Timbering shaft bottom	1	.....
Main-line road cleaner	.....	1
Bottom battery charger	.....	1
Total	2	2
Total, all fatalities underground	3	8

Table II—Lost-time Injury Record at Mines of the Consolidated Coal Co. of St. Louis Since Jan. 1, 1927

	Mine No. 7, Herrin	Mine No. 15, Mt Olive
Total mine-days lost	6,806	39,131
By night forces	142	421
By top crews	389	1,581
Miscellaneous	707	8,292
Production per "mine-day" lost, tons	310	133

Table III—Comparative Tonnage Produced per Compensable Injury of Mine No. 15, Consolidated Coal Co. of St. Louis. Change-over to 100-Per Cent Mechanical Loading Made in November, 1929

	Tons
1927, hand loading	5,252
1928, hand, some conveyor loading	5,685
1930, 100-per cent mechanical loading	10,600
1931, same	17,064
1932, same	19,790
1933, same	14,931
1934, same (first quarter)	16,815

Table IV — Tonnage Produced per Compensable Injury in Hand and Mechanical Loading, Mine No. 7, Consolidated Coal Co. of St. Louis. Loading 90-Per Cent Mechanized in 1931; Other 10 Per Cent Hand-loaded

	Tons		
	Mechanical	Hand	Average
1931	12,514	6,768	10,909
1932	25,811	7,755	21,514
1933	20,976	4,745	16,425
1934†	24,744	17,147*	27,193

*No accidents in this period.
†First five months.

Table V—Distribution of Safety Savings in Seven Contests at the Kathleen Mine, Union Colliery Co., Dowell, Ill.

Contest Period	Foremen: Number	Foremen: Share, Each	Men: Number	Men: Share, Each	Total Distributed	Production	Cost of Accidents, Per Ton
Oct. 1–Dec. 31, 1930	5	$100.00	127	$22.78	$3,394.57	324,011	$0.029
Jan. 1–March 31, 1931	5	105.73	118	23.99	3,524.77	325,357	0.028
April 1–June 30, 1931	4	25.00	137	5.00	785.00	255,303	0.044
July 1–Sept. 30, 1931	6	25.00	253	4.70	1,340.58	269,625	0.040
Oct. 1–Dec. 31, 1931	8	5.00	357	1.47	415.50	201,278	0.046
Jan. 1–March 31, 1932	10	10.00	318	2.91	1,027.58	145,103	0.036
Jan. 1–March 31, 1934*	8	58.50	288	9.26	3,133.97	246,727	0.024

*Mine idle from March 31 to Aug. 11, 1932. No safety-savings contest from Aug. 11, 1932, to Jan. 1, 1934, during which time the accident cost rose to $0.055 per ton.

loading, timbering, tracklaying and all other labor, including the repair of machinery and the transportation of coal, from the face to the parting. These operations involve 75 per cent of the men employed underground.

"Safety Savings Contests" were credited with material reductions in accident cost at the Kathleen mine of the Union Colliery Co., Dowell, Ill., by Ed Leming, general superintendent. Reviewing the history of the movement, Mr. Leming pointed out that the mine had started up in 1929 after an idleness of two years, with the result that previous employees for all practical purposes had the same status as the new employees taken on at that time. With no unusual circumstances, accident cost in 1929 was 6c. per ton, and, as the usual methods were not getting results, the safety savings contests were started.

The first contest (Table V) was started on Oct. 1, 1931, with a total of eighteen teams participating. As the mine was entirely on the mechanical-loading basis, each section with one or two loaders and a foreman, this facilitated the division of most of the underground workers into eleven teams. Other teams were organized as follows: mechanics and chief electrician; motor boss and main-line men; night boss and crew; and four surface groups. Five cents per ton was selected as the base cost for all expenses in the prevention and treatment of injuries, the savings from any reduction to be divided 50-50 between the company and the employees on the winning teams, 15 per cent of the employees' share to go to the foreman. No team with a lost-time injury charged to it has ever shared in the cash distribution, said Mr. Leming, who also stated that, in the contest now going on, in the absence of any change from present conditions, the cost of accidents will approximate 1½c. per ton. Working on a three-month period offers some difficulty in estimating disabilities. This work, however, is done by a committee, which makes its decisions liberal enough to take care of contingencies, and a reserve has been established to take care of unusual cases.

Tracing the history of mine disasters and legislation in England and the United States from 1621, John E. Jones, safety engineer, Old Ben Coal Corporation, Zeigler, Ill., pointed out that mine legislation was slow to start and that most of the advances in safety and legislation were initiated by outside interests concerned with the high death rate and disasters in the industry. First legislation in the United States was based on English laws, Pennsylvania leading off in 1869 with a bill for the appointment of a mine inspector for Schuylkill County. Illinois was the first bituminous State to adopt a mine law in 1870.

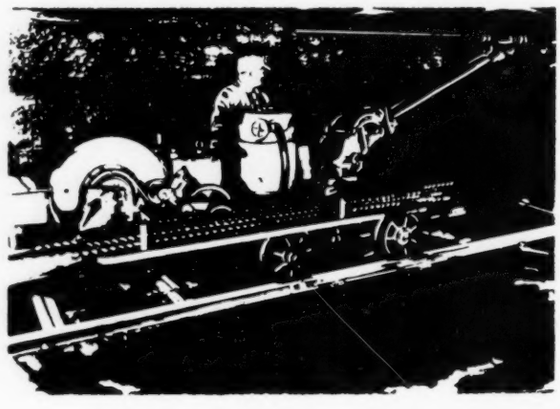
Light alloys possess a number of advantages in the coal-mining industry, said I. D. Marsh, superintendent, Alcoa Ore Co., Belleville, Ill., in an analysis of possibilities in the industry. The 20-cu.yd. dipper is commonplace in bituminous stripping, but 30-cu.yd. models are now being considered and are made possible by light alloys. Weight reduction in any dipper means a greater pay load without other changes in equipment, and the use of such alloys probably will extend to dipper sticks, booms and equipment.

Excessive weight is a major problem where acceleration stresses increase power demand or heavy impact shortens equipment life. Light alloys offer relief, and are available, said Mr. Marsh, in all standard sizes and forms, as well as in structural shapes, with a strength equal to steel at approximately one-third the weight. Light-weight forgings and castings also are available in high-strength, heat-treated alloys.

Typical applications cited by Mr. Marsh included: screens, where the reduced weight would decrease vibration, the size of structures and power requirements; aerial tramway buckets, lower rope cost and greater capacity; cages and skips—decreased rope load and cost, higher safety factor, longer life and lower peak and total power requirements; and portable equipment, where the lighter weight facilitates handling. A further advantage cited by Mr. Marsh is the fact that most light alloys are highly corrosion-resisting.

Sketching the development of the coal saw, Dewey F. Joy, Sullivan Machinery Co., Chicago, offered eight case studies based on both full-scale and experimental operation. In the 40-in. Straight Creek seam in eastern Kentucky, with 4 in. of rash in the roof, the saw averages 150 tons per shift and gives the following results: a reduction of 2 per cent in the ash content of the nut-and-slack; a maintenance cost of 4c. per ton, against 8c. with the shortwall cutter previously used; and an increase of 1½ tons in the daily output of the loader. A production of 220 tons per shift and an increase of 1.14 tons in the daily output of the loader has been marked up in the Pocahontas No. 4 seam in southern West Virginia. Maintenance cost is 1.12c. per ton. In the Pocahontas No. 3 seam, with 10 in. of bone near the top, the use of the coal saw has permitted the gobbing of a substantial part of the 1,100 tons of bone previously loaded in a 3½-ton car and has reduced the ash content of the ½-in. slack by 2 per cent. Saw output at another operation in the Sewell seam in southern West Virginia has averaged 300 tons per shift.

At a captive operation in the Elkhorn No. 6 seam in eastern Kentucky, where slack is not a disadvantage, the saw has been used to reduce cutting per place (two shear cuts and one horizontal cut) to two-thirds of the shortwall time. Two sticks of explosive are now used in two holes, against five sticks in three holes before, Mr. Joy stated. Another example of the use of the saw to reduce explosive consumption was based on trial tests in Illinois, where 30 tons of coal was blasted with 1 lb. of explosive, against 8 tons with the regular machine-cut coal, and in Indiana, where 2½ sticks were used in three holes, as compared with 9 sticks



in five holes. At a mine in western Pennsylvania, where the coal is overlaid by 36 to 72 in. of drawslate, 6 to 8 in. of top coal and a thin band of bone, the saw is used to eliminate the disruption of the roof by explosives and thereby prevent heavy falls of drawslate which have closed down certain areas in the mine. An operation in the Fifth Vein in Illinois employs the saw not only in coal but also to shear the bottom on both sides of the track for a permanent roadway, the material between the shear cut being loosened by the breaker pad.

With air mining, which depends upon the sudden release of a large volume of compressed air from a cartridge tamped in the drillhole, pressure and volume of air can be controlled and thereby the breaking effect of the "shot," said Fred Miller, Franklin County Coal Co., Royalton, Ill. Air mining was first developed and applied at Royalton three years ago. Now 80 per cent of all mechanically loaded and 40 per cent of all hand-loaded tonnage is produced this way. Equipment consists of a compressor capable of developing a maximum pressure of 12,000 lb. per square inch and renewable-disk cartridges. Pressures are controlled by the thickness of the disk: 12-gage giving 6,500 lb., and 13-gage, 5,500 lb. No change in the usual mining system is necessary and the equipment can be operated by a two-man crew. Two compressor units, working two shifts, supply four mechanical loaders with coal at Royalton.

Disadvantages of air mining as listed by Mr. Miller, include: a capital investment larger than would be represented by the explosives supply normally on hand; possible drilling complications, due to the larger holes required; maintenance of an additional piece of equipment; additional power, the demand varying from 30 to 60 kw., depending on pressure and charging speed; and interference with haulage when first installed. Advantages include: greater safety; better roof conditions, due to milder action; more lump; less degradation in subsequent handling; opportunity for the use of moist drill cuttings in stemming, thus avoiding possible ash-adding material; opportunity for blasting on the working shift; confinement of the loader to fewer working places; less digging required, in general; no reduction in labor, thus avoiding an unfavorable reaction from employees; and economy.

Versatility in permissible explosives means the faculty of providing a safe force for the dislodgement of coal under the varying conditions met with in coal mining, declared R. Y. Colclesser, technical representative, E. I. duPont de Nemours & Co., Inc. Factors in versatility include: size of cartridge, meeting drilling limitations; varying density to fit with maximum efficiency variations in types of coals, mining methods and other conditions; control of emission of smoke and fumes; and variation in detonating speed to suit the coal. Permissible explosives, said Mr. Colclesser, provide a form of energy which may be stored in large or small quantities, as desired, and may be transported by the shooter without interfering with transportation or the movement of equipment.

While there is a need for engineers in the mining industry, the demand is low at the present time, said Prof. D. R. Mitchell, University of Illinois, in discussing educational and professional prospects in the mineral industries. Citing the striking lack of relation between the number of students and the value of mineral production in the various States, Professor Mitchell offered an analysis of the occupations of fathers of boys taking mining engineering in Illinois, which showed that in only three cases were they connected with the coal industry. Practically all sons of coal men take other courses than mining in Illinois.

Suspended Drive Eliminates Shock From Shakers At New Consolidation Tipple

(Concluded from page 278)

tables consisting of two units operating opposed. Mr. Murry has applied for patents covering the idea.

The new tipple includes crusher, vibrating screens, mixing conveyor, slack storage bins and all other facilities for shipping any size or mixture demanded. There are four loading tracks, three apron-type loading booms and seven loading points. Five sizes can be loaded simultaneously. Dimensions of the main section of the tipple are 64x70 ft. One wing, or addition, to the main structure houses the vibrating screens and slack bins and another the railway fueling station and local domestic sales bin.

From the dumphouse, located close to the tipple, the coal is carried to the main shakers by a 48-in. belt conveyor. Any size except slack can be sent to the Jeffrey 36x36-in. single-roll crusher which was installed principally to crush lump or egg sizes. When loading booms are raised to horizontal or with ends above horizontal, these sizes are sent to the crusher by the mixing conveyor.

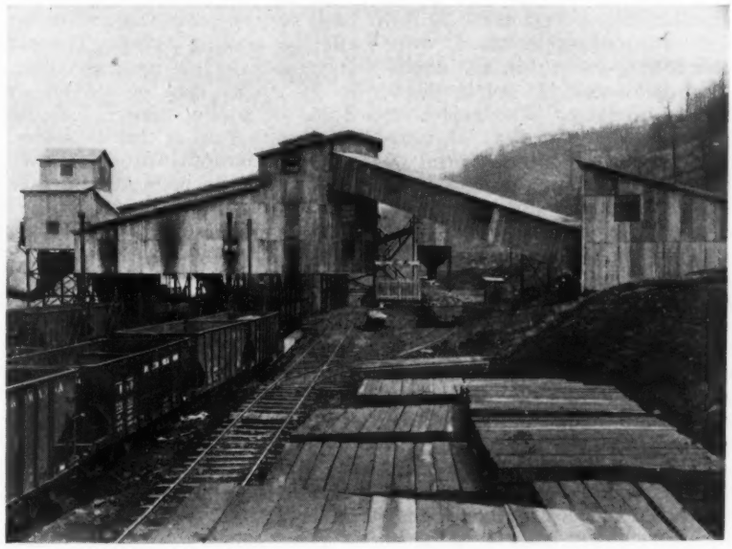
Separation of small sizes is effected by an installation of four Bronco 4x8-ft. vibrating screens located above the slack bins. These bins are each of 100 tons capacity, one for $\frac{3}{4}$- or 1-in. slack, and the other for $\frac{3}{8}$- or $\frac{1}{2}$-in. slack.

Refuse from the picking tables is carried to an outlying refuse bin by a 16-in. belt conveyor. This refuse is then loaded into mine cars and hauled about 2,000 ft. to the dump. The 16-in. refuse conveyor and the 48-in. raw-coal conveyor are the only two conveyors of the belt type in the plant.

Motor-drive connections are combination V-belt and single gear reduction, except that on the lump and egg booms "Heliocentric" reducers made by the Universal Gear Corporation are used. These gear units were on hand and were thus utilized.

General design and construction of the plant was handled by the Fairmont Mining Machinery Co. All items of equipment except motors, drive connections and crusher were made by that company.

"Complete Tipple" Recently Put Into Use at Mine No. 63.



NOTES

. . . from Across the Sea

EXPERIMENTS in Belgium have shown that a cartridge sheathed with calcium fluoride or with a mixture of that material with sodium chloride (common salt) would prevent the emission of flame. The ends of the cartridge do not need to be sheathed and the calcium fluoride can be mixed with a bonding agent, such as plaster of paris or dried clay. Use of such sheathed explosives is said to be increasing. The cartridge thus sheathed is commonly named after M. E. Lemaire, for many years director of the Institute National des Mines of Belgium. At the (British) Institution of Mining Engineers, recently, C. A. Naylor and R. V. Wheeler presented the results of studies they had made into the use of such sheaths, stating that 4 oz. of any British permitted explosive, and even 2 oz. of some of them, will ignite a mixture of methane and air if in direct contact with the explosive, but if the explosive is placed in an unstemmed shothole, 8 oz. will fail to cause ignition, and if a single inch of dry clay stemming is provided, 28 oz. can be fired without ignition.

Messrs. Taylor and Wheeler had hoped that instead of using what probably is only a cooling agent they could use something that would inhibit the flame—that is, it might make the explosive burn flamelessly by retarding or preventing one or other of the successive chemical reactions that produce flame. This inhibitor might be put in the atmosphere, in the sheath or in the cartridge. To ascertain the value of such inhibitors, cartridges were suspended in a 9-per cent mixture of methane and air in a gallery 5 ft. in diameter. No. 6 low-tension 80/20 fulminate detonators, copper-cased, were used embedded ¼ in. within the explosive. Such detonators do not in themselves ignite firedamp. The explosive, which may be designated as *A*, contained 10 per cent of nitroglycerin, 60 per cent of ammonium nitrate, 20 per cent of sodium chloride and 10 per cent of wood meal. Any unsheathed charge greater than 2 oz. would cause an explosion in a 9-per cent mixture of methane or air.

Seeing that 3 parts in 10,000 of ethyl iodide will raise the ignition temperature of a 5.8-per cent methane-air mixture 230 deg. F., thus showing a great reduction in flammability, and that tetraethyl lead not only raises the ignition temperature but prolongs the "lag" on ignition threefold, the experimenters decided to use halogen compounds (chlorides, bromides, and iodides) in the expectation that they would suppress flame.

Ethyl iodide and tetraethyl lead are liquids and impracticable for the ultimate purpose. However, both were tried, ethyl iodide being absorbed by the powdered clay which was used to form the sheath, whereas the unstable, readily oxidized tetraethyl lead was placed in sealed capsules which were embedded in the explosive itself. However, neither gave sufficient protection. When these two inhibitors were used, ignition was obtained in a 9-per cent methane-air mixture with only 4-oz. cartridges of the explosive. In further experiments, the explosive which, unsheathed, had a limiting charge of 2 oz., sheathed with ammonium bromide had a limiting charge of 4 oz.; with sodium chloride, 6 oz.; with potassium iodide, also 6 oz.; and with potassium chloride, 8 oz. The experimenters concluded that the inhibitors acted not so much because the iodine or chlorine they contained raised the temperature of ignition as by reason of the heat they abstracted.

So for the present they were forced back to the possibility of using some effective cooling agent. The explosive being used had in itself a cooling agent in its 20 per cent of sodium chloride, 2 oz. of cooling material being combined with 8 oz. of true explosive. This question naturally arose in the minds of the experimenters: Could this material be placed just as well in the sheath or stemming as in the explosive itself, thus retaining all the strength and sensitivity of the explosive and rendering it equally indisposed to fire methane? So another explosive, *B*, was formed with the same ingredients in the same relative proportions but with sodium chloride omitted; this explosion contained nitroglycerine, 12.5 per cent; ammonium nitrate, 75 per cent; and wood meal, 12.5 per cent. These shots were fired from a cannon into the same gallery.

When powder *A* was fired its limiting charge was found to be 20 oz., but with explosive *B* stemmed with 4 oz. of sodium chloride, the limiting charge was the same, and with explosive *B* sheathed with 3½ oz. of sodium chloride was 17½ oz. The 20 oz. of explosive *B* should be at least as effective as 25 oz. of explosive *A*. And if the same percentage of sodium chloride were used, 5 per cent of it would be needed. Instead, only 4 oz. was used in the stemming. Less than 2 oz. of explosive *B* suspended free in the gallery filled with 9-per cent methane caused ignition.

These results were encouraging, so four types of compounds were used in further experiments: (1) those that, by their high thermal conductivity, would cool flame when formed; (2) those that would blanket the exploded materials with non-flammable gases; (3) reducing agents that would unite with oxygen more readily than methane does and therefore might prevent the ignition of methane and substitute a flameless combustion of their own; and (4) oxidizing agents which might oxidize the methane flamelessly and thus prevent it from burning in air with production of flame. Results were as Table I:

Table I—Limiting Charges With Various Sheathing Materials

Material	Character	Limiting Charge, Oz.
No sheath	—	2
Kieselguhr	Low density	4
Lead sulphate ($PbSO_4$)	High density	6
Sodium thiosulphate ($Na_2S_2O_3$)	Reducing	6
Sodium bisulphate ($NaHSO_3$)	Reducing	6
Sodium formate ($HCOONa$)	Reducing	8
Manganese dioxide (MNO_2)	Oxidizing	8
Ferrous oxalate (FeC_2O_4)	Oxidizing and cooling	8
Sodium carbonate ($Na_2CO_3 10H_2O$)	Yields steam	8
Sodium hyposulphite ($Na_2S_2O_4$)	Reducing	10
Sodium bicarbonate ($NaHCO_3$)	Yields carbon dioxide	10
Iron filings	Cooling	12

Taking the last three, because most effective, it may be said that iron filings are of value because they have high thermal conductivity, but if forming a sheath $\frac{5}{32}$ in. thick, as provided in these tests, the weight would be excessive. Experiments showed that, down to $\frac{1}{16}$ in. thick, the effectiveness of sheaths of iron filings decreased as the weight, in proportion to the weight of explosive, was decreased. It is thought that the filings could be made to adhere to the interior of an outer wrapping much as sand is held on the surface of sand paper. Work with the other two sheathing materials has been continued so that manufacturers now view their use as practicable. In fact, a number of sodium-bicarbonate-sheathed explosives are now on the British market. Sodium hyposulphite not only cools but gives a blanket of incombustible sulphur dioxide, which also is reducing. Sodium bicarbonate cools and blankets the flame with carbon dioxide. It has the advantage of being of low cost.

Other tests were made with explosives containing nitroglycol, shooting them unstemmed from a cannon. Sheathing with bicarbonate of soda was greatly helpful in every instance. To put the

anti-flame agent in the stemming is of value, provided the shot blows out the stemming, but if it blows out back of the stemming, it can be of little avail. Sometimes the explosive is in direct contact with firedamp, and in that case the sheathing gives protection that is greatly needed. Sheathed explosives have much the effect of cushioned shots, and make more large coal than the same explosives unsheathed. They also make less fumes. The value of the sheath does not decrease with aging, and the sheathing material does not interact with the explosive. The cost in Great Britain was 20 per cent higher than for unsheathed explosives, probably because of the limited use of the former. In Belgium, it was only 10 per cent higher. Perhaps a sheathed cartridge might be made of a more readily detonable explosive and one which unsheathed would be less safe, but Dr. Wheeler thought it should not be permitted, for the sheathing might drop off and then the explosive would not be of standard safety. Objection was made to iron filings because of the risk of sparks in tamping.

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted. Orders for other books and pamphlets reviewed in this department should be addressed to the individual publishers, as shown, whose name and address in each case is in the review notice.

Private Police, by J. P. Shalloo. American Academy of Political and Social Science, Philadelphia, Pa. 224 pp. Price, $2.50.

Private police in the coal fields generally become a subject of public discussion only when passions are inflamed and prejudices are sharpened by the heat of industrial strife. Such a situation is hardly conducive to calm and dispassionate study. The author of the present volume, while compelled by circumstances to draw upon these ruddy episodes for much of his material, makes an earnest endeavor to render an impartial verdict. If he is inclined to view labor's attitude toward private police with sympathetic tolerance, he does not close his eyes to the provocative tactics sometimes indulged in by strikers. Although he regards the existence of private police as a legal anomaly, he feels convinced that they "are at the present time practically indispensable."

After tracing the history of the coal and iron police of Pennsylvania from their organization in 1866 to 1930, Mr. Shalloo reaches the conclusions that: (1) Present organization, supervision and compensation are unsatisfactory; (2) legislative attempts to improve methods of industrial policing have so far failed; (3) "organized labor must assume much of the responsibility for industrial chaos during emergencies"; (4) mine owners and industrial groups are not entitled to special protection by the State involving a delegation of the police power for such a purpose.

Finally, Mr. Shalloo voices the opinion that the greatest bar to a satisfactory solution of the problem lies in the antagonism between mine owners and union labor, coupled with the fear that "reasonable concession by either amounts to abdication." But the author himself discounts the possibility of a settlement in this direction when he states earlier that "the owners' interests and those of labor are not and cannot be identical." To this conclusion we must vigorously dissent; its acceptance means a hopeless admission of the existence of a class struggle which would destroy the partnership conception of enlightened industrialism.

In addition to the chapter devoted to the coal and iron police, the volume also covers the organization and operation of railroad police, private detectives and private watchmen. Although praising the work of the Pinkertons in ending the reign of Molly Maguires and finding the detectives more sinned against than sinning in the Homestead riots, the author entertains no high regard for industrial under-cover work.

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Procedure Handbook of Arc-Welding Design and Practice. Lincoln Electric Co., Cleveland, Ohio. 434 pp., 6x9¼ in. Price, $1.50.

Welding has so broad an application to mining problems that this book of procedure will be welcomed by the industry's mechanical men. It opens by describing welding methods and equipment—forge, thermit, resistance, gas, metallic-arc, carbon-arc and shielded-arc welding, electrode holders, electrodes, shields, booths and tables. Then comes technique—length of arc, joint types, strength of welds, contraction and expansion — followed by procedures, speeds and costs for welding mild steel; structure and properties of weld metal; weldability of metals; designing for arc-welded machinery and structures, with particular jobs.

Composite Rate Book of Freight Rates on Bituminous Coal and Coke. James H. Simons Printing Corporation, Pittsburgh, Pa. 198 pp. Price, $5.

This volume covers in convenient form current freight rates on bituminous coal from producing districts in Pennsylvania, West Virginia and eastern Kentucky to destinations east of the Missouri River, including Canada. Lake-cargo and tidewater coal rates also are shown. Special sections cover coke rates from Eastern ovens and anthracite rates to principal consuming points. While the tariffs on file with the Interstate Commerce Commission at Washington are the last word on actual rates and routing, the present compilation brings these rates into convenient compass for quick comparisons. It is planned to make the book, which has been compiled under the direction of Louis H. Kelly, vice-president, Continental Coal Corporation, an annual volume with supplements to cover major rate changes as they may occur.

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The Ignition of Firedamp by the Filaments of Broken Electric Lamp Bulbs, by G. Allsop and T. S. E. Thomas. (British) Safety in Mines Research Board, Paper No. 80, 13 pp. British Bureau of Information, New York City. Price, 17c.

In connection with the lighting of important coal-mine road junctions the S.M.R.B. has made researches into the possibilities of ignition of firedamp when electric lamp bulbs are broken and the current switches off concurrently, or is switched off just before the lamps are broken, and into the time of cooling of incandescent filaments to 1,200 deg. C. Hence, this bulletin. In reporting the experiments into the ignition of methane, the material of the filament is nowhere stated. Where the light was a 12-volt, 3-amp. gas-filled lamp, two tests caused firedamp to be ignited in 0.25 second and one in 0.04 second, and in no case did ignition fail to occur.

When pointed contacts were used instead of disks for breaking the bulbs, the minimum delays for ignition were obtained only when the glass of the bulb was completely broken away. With a 2-volt, 1-amp. vacuum lamp, the minimum delay was 0.03 second; with a 4-volt, 0.75-amp. vacuum lamp, 0.02 second; with a 4-volt, 0.75 amp., gas-filled lamp, 0.07 second; and with a 6-volt, 1-amp. lamp, 0.08 second. In each case the firedamp was ignited without the fusing of the filament.

The filaments of a gas-filled lamp carrying a 4-volt, 0.75-amp. current cooled to 1,200 deg. C. in less than one-half as long a time as did a vacuum lamp carrying equal voltage and amperage, despite the higher temperature of the filament of the gas-filled lamp—2,160 deg. C. as against 1,950 deg. C. A gas-filled lamp with 12-volt and 6.9-amp. current was 1.66 seconds in completing its cooling to 1,200 deg. C.

OPERATING IDEAS

From Production, Electrical and Mechanical Men

■

Unusual Control Circuit Protects Substation Equipment

MOST substations now in service are equipped with full-automatic d.c. feeder breakers, but manual equipment for control of the motor-generators or converters is retained in many located where a man, normally on some other job, is available to start or stop the machines. The protective features afforded by the full-automatic substation are well recognized, and some of the items, such as bearing thermostats and certain interlocking equipment, often are added to a manual station to give added protection.

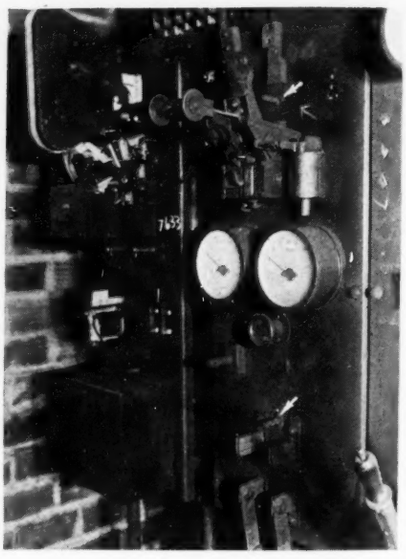
For automatically opening the d.c. breakers of other machines in case the breaker on one machine opened and threw the remaining load on the others, this automatic opening to take place independent of the overload trips, which had been known to fail, an unusual electrical interlock system was designed by R. B. Peddicord, chief electrician, and installed several years ago at the Jere substation of the Sunrise Coal Co., in the Scotts Run field of northern West Virginia. One condition to be met was a foolproof design that would not require manual operation of any switches in the new control circuits.

The substation, the only one at the mine, is close to the slope portal and tipple. Equipment consists of three 100-kw. motor-generator sets with manual control panels. The outgoing d.c. feeder line is equipped with a reclosing breaker.

The accompanying wiring diagram includes only the revised control circuits of the motor-generator sets. The undervoltage coils and the auxiliary switches *A, B* and *C* function in connection with the manually operated d.c. air circuit-breakers of each generator. These auxiliary switches are of the standard type usually employed for bell circuits and are depressed by the d.c. circuit breaker arms when the breakers are closed. When a breaker opens, a spring in the auxiliary switch opens the control circuit.

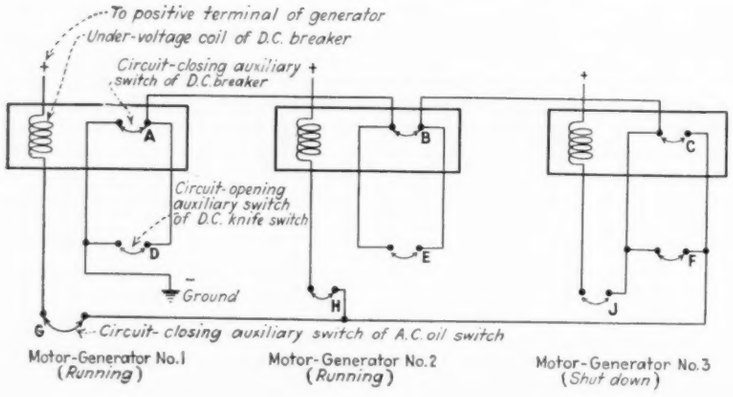
Other auxiliary switches (*D, E* and *F*) of the same type but with contacts reversed are depressed when the generator knife switches are closed, thus holding open these control circuits. Springs close the circuits when the knife switches are opened. The six auxiliary switches operated by the three breakers and three knife switches were added to the switchboard by Mr. Peddicord. Other auxiliary switches, *G, H* and *J*, already were on the a.c. oil switches as standard equipment connected to open the d.c. breaker if the a.c. switch opened for any reason.

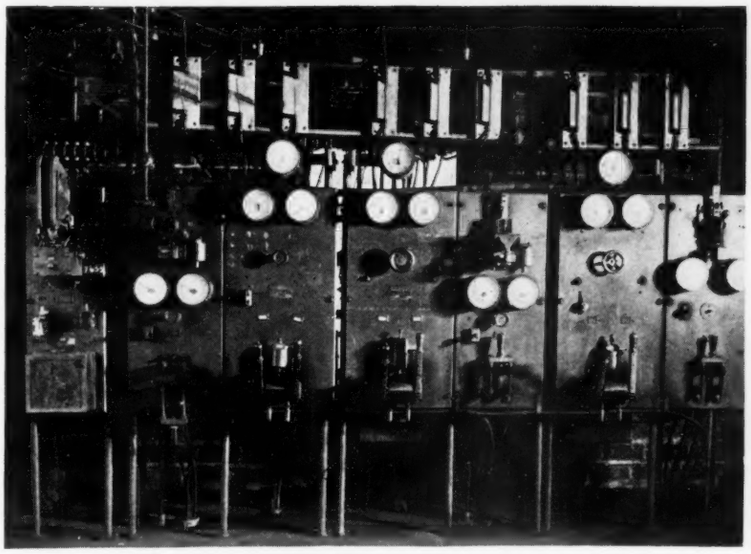
The diagram shows the position of the auxiliary switches with Generators Nos. 1 and 2 running, and Generator No. 3 down. Assuming that the d.c. breaker of Unit No. 2 opens as a result of an a.c. or d.c. overload, Auxiliary Switch *B* opens, and, as the knife switch is still closed, the circuit through the holding coil on Unit No. 1 is opened, resulting in the opening of the No. 1 d.c. circuit breaker to protect the unit from the overload. If three machines are operating and the d.c. breaker of one opens, the action is the same, and the d.c. breakers of both the other machines are opened.



Arrows Point to the Operating Pins of Auxiliary Switches.

Control Circuits of the Three Generator Panels.





Six Panels to Control Three Units; an Automatic Feeder Breaker Appears at the Left.

One of the difficulties commonly encountered in manual operation, particularly if one of several men other than the regular substation attendant may be called upon to manipulate switches or start a machine, is the tendency to close the d.c. generator switch first and the breaker last, thus burning the breaker contacts. The breaker should be closed first, and then the knife switch with a quick, positive movement. Assuming that Unit No. 3 has been started and is to be connected to the d.c. bus, closing the knife switch first causes the immediate opening of the d.c. breakers on the other two machines through the operation of the control circuit, thus protecting the No. 3 circuit breaker from the possibility of burning in addition to forcibly calling attention to the incorrect manipulation.

An apparent disadvantage of this scheme of control is that in shutting down one machine its knife switch must be opened before the d.c. circuit breaker is tripped. If, however, the voltage has been lowered to the right figure for shifting the load to the other machines, there is little chance of burning the knife switch. Mr. Peddicord states that the control has prevented repetition of difficulties encountered before the substation was so equipped.

Fan Installation Removes Dust To Facilitate Inspection

Proper inspection of materials depends primarily on giving the inspector maximum opportunity for using his eyes. Lighting should come from the proper angle and the brilliant surface of the source should be shaded to remove it from the inspector's field of vision. Lighting intensity should approach that of daylight. Observation of these principles, however, may not remove all interference, as experience at the Anchor Coal Co. mine, Highcoal, W. Va., has shown.

At this operation, the inspection table consists of a wide apron conveyor over which the mine-run is passed after leaving the dump hopper on its way to the shaker screens. The location of the table resulted in serious impairment of the inspector's view of the coal through the presence of dust in the air. Higher lighting intensity resulted only in added illumination of the dust particles and thus apparently increased the quantity. The solution involved the installation of a fan to blow clean air over the conveyor and thus drive the dust to one side.

The fan and conveyor are shown in the accompanying illustration. The inspector stands close beside the fan, but is shielded from the full force of the current. By using a large fan—30 in. in this case—and operating it at a moderate speed, the cross-section of the air current is large and the velocity is reduced sufficiently to prevent the stirring

Maintaining a Flow of Clean Air Over the Conveyor Alleviates the Dust Problem.

up of additional dust and its distribution throughout the tipple. The fan tends to pull air through an open window just back of the driving motor.

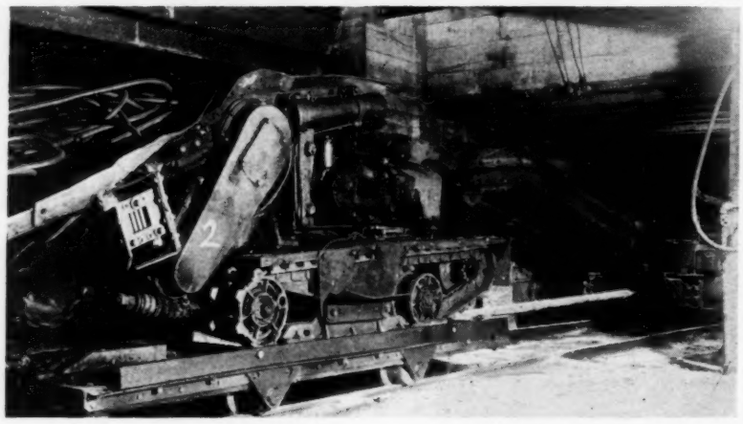
No Vacations

There never comes a time when new problems or old problems in a new form are lacking around a coal mine. This means that operating, electrical, mechanical and safety men need both training in meeting the unexpected and a reservoir of knowledge from which they can extract without delay a direct solution to the immediate problem or one which can quickly be adapted to the situation. These pages furnish selected items for the filing cabinet, whether it be in the head or in the office, and also are open for your contribution. Writing skill is not a necessity, as it is the idea which counts. Send yours in. *Coal Age* will pay $5 or more each for those that are acceptable.

Truck Moves Loading Machines Long Distances

When major repair or overhauling of loading machines is necessary, it is much cheaper to do this work at repair shops on the shaft bottom or outside where overhead cranes and pits are available and lighting is good. This is the practice at the Zeigler (Ill.) No. 1 mine of the Bell & Zoller Coal Mining Co., and in order to reduce the time and expense of bringing the Joy loading machines used to the shop and taking them back to the working place, the repair department designed and built the low steel transporting truck shown in the accompanying illustration. By placing a tie under the end of the truck and using other ties to build a ramp, the machine can be loaded up under its own power or, in case of motor failure, with a block-and-tackle, according to John Lyons, safety engineer.

When the loader is properly centered on the truck, it is locked in place by round steel pins equipped with cotters. These pins are placed at each end of the tread, and extend through the sides of the 14-in. channels on which the caterpillar tracks rest. The gathering locomotive used to move the truck carrying the loader is attached by a piece of 2½-in. pipe of the proper length. The one-way trip of 1½ miles is made in 15 minutes, whereas the machine traveling on its own caterpillars would require



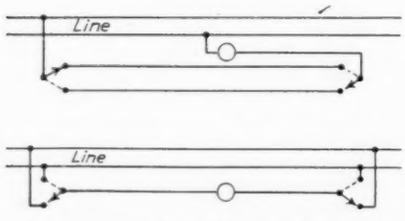
Loader on Truck Ready for Movement After Being Overhauled.

approximately 2 hours. In some instances, loaders have been taken in during the working shift when major repairs were necessary on the machine already working.

Major members included in the truck base are two 12-in. channels 10 ft. long. Over-all width is 4 ft. 8 in., and the wheels, equipped with Hyatt roller bearings, have a diameter of 7 in. The distance from the top of the rail to the top of the loader when on the truck is 5 ft. 9 in.

Wire Requirements Reduced By Unusual Hook-up

When a lamp or other electrical device located part way or midway between two remote points is to be controlled from either of the points, the conventional wiring for three-way switch control may involve two and one-half



Top, Conventional Wiring; Bottom, Special Wiring.

times the length of wire necessary for another system seldom used but which provides the same flexibility of control. The accompanying sketch shows both the conventional and simplified wiring systems.

Application of the simplified system is limited to installations where both of the line wires are carried past the two locations of the three-way switches. As an example, it may be desirable in a conveyor gallery containing stairs or a walk-way to control the lighting along the passageway from either end, lighting at the terminals being powered from line wires common to both. Other possibilities are slope and yard lighting and certain lights in mine passageways.

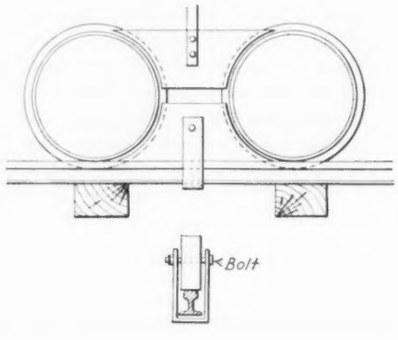
A possible objection is the fact that when the lamp is not turned on, both sides of the socket and the feed wires thereto are "hot," not with respect to each other but to the other line feeder wire and possibly to ground if the three-way switch positions are such as to make a connection to the ungrounded wire. When the lamp is turned off it will be in parallel with a section of one line conductor at times and with a section of the other line conductor at other times.

In considering the advantages of the conventional method it should be remembered that the three-way switch is in effect a single-pole switch and that the lamp is "hot" with respect to the other line even when the unit is turned off. If the circuit is of the grounded type and the conventional three-way switch wiring diagram is being followed, the lamp socket preferably should be connected to the grounded side of the line. That places the lamp at ground potential when it is turned off.

Safety Block for Cars

Old wooden brake blocks are suggested for use as car stops by Arnold Curry, Wyano, Pa., in accordance with the system shown in the accompanying illustration. The old blocks are cut down to the proper size and are anchored to the rail between the wheels by a bolt passing through holes in a U-shaped piece of strap iron. This type of stop, says Mr. Curry, locks to the rail and holds the car from moving in either direction, and does not require the presence of a tie to hold it in place.

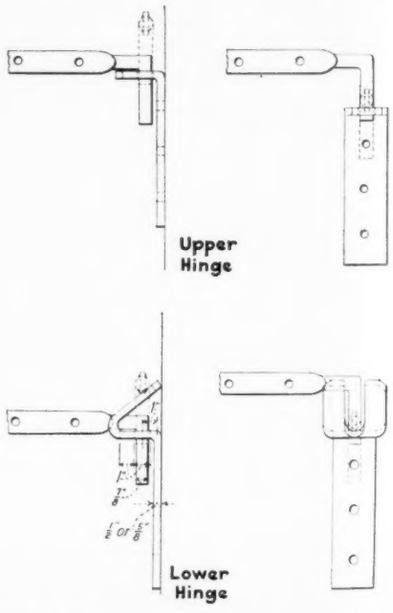
Showing Use of Old Brake Block as Car Stop.



Hinge Provides Automatic Door Closing

A special hinge which insures automatic door closing without the use of ropes and pulleys or other cumbersome equipment has been developed by James Cardwell, mine foreman, Black Diamond Coal Mining Co., Drakesboro, Ky. In addition to its self-closing feature the hinge is said to be simple, cheap and adaptable to construction in any mine blacksmith shop. Robert Rives, fireboss, supplies the following description.

The special hinge, which is designed for installation on the bottom of the door, is made of ordinary strap iron 3 in. wide, ½ or ⅝ in. thick and 18 in. long.



Special Hinge Allows Door to Close Automatically. Dotted Lines Show Open and Closed Positions.

In addition to three holes for fastening the hinge to the post by bolts or lag screws, a 1-in. hole is bored in the stock 7 in. from one end to receive the door part, after which the stock is turned 90 deg. at a point 8 in. from the end. The 8-in. section is then split to within 1 in. of the hinge hole, and the split ends are rounded on the anvil and turned back as shown in the accompanying illustration, so that as the door opens it gradually is raised up on one of these turned-back ends. When the door is released, the hinge part attached to it automatically slides down the inclined path furnished by the turned-back end of the post part of the hinge into the socket.

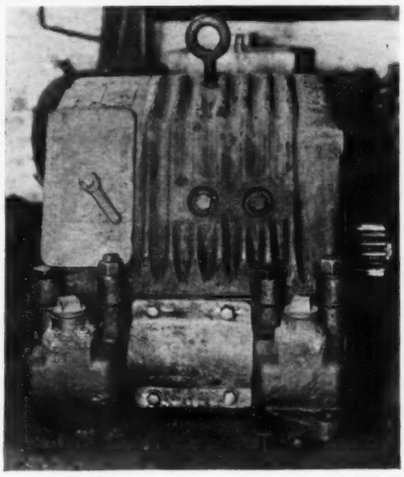
The top hinge is made of the same material as the bottom, but is 4 in.

shorter and is made without the turned-back ends. The hinge parts which support the door are made of ¾-in. round rod 24 in. long, flattened to within 6 in. of the end and drilled for bolting onto the door. The round end then is turned at a 90-deg. angle to allow it to fit into the hole in the post part of the hinge.

Design Changed to Improve Axle Lubrication

Part of the job of reducing maintenance cost consists of improving the design of parts responsible for continuous or repeated trouble. Lubrication and the related problem of keeping sand and dirt from mixing with lubricant play an important part in this phase of equipment betterment. On mine locomotives of all but recent designs, lubrication of the axle bearings frequently is not properly arranged to prevent undue wear. After the brasses have been worn a small amount the gears no longer mesh properly, with the result that the brasses are then damaged more rapidly by shock, high pressures due to gear wedging, added lubrication difficulties and the entrance of dirt.

The accompanying halftone illustrates the changes that are being made in mine-locomotive motors at the Stanaford (W. Va.) mines of the Elkhorn Piney Coal Mining Co. The hinged covers of axle boxes have been replaced by short nipples threaded on the inside, into which 2-in. pipe plugs are screwed. The hinged covers were never perfectly tight, and very often they got into such condition that they afforded little protection against entrance of dirt. The pipe plug covers always are perfectly tight. Nipples were attached by welding them to the axle box. It will be recognized that more time will be required to do the greasing and that a special tool is necessary. This objection,



Showing Axle Cover and Axle-Box Plugs.

however, is considered of little moment in view of the fact that standard practice is based on eliminating lubrication by motormen in favor of shop service. Wool yarn no longer is used in the axle box, but instead the space is filled with heavy cup grease.

Another change in these locomotive motors consists of installing a cover of heavy plate over the axle between boxes. This cover is fastened with capscrews and is made to fit fairly tightly at the ends. When assembled, the whole space under this cover is filled with heavy cup grease. Grease that works its way out through the bearings tends to force away any sand or dirt that otherwise would enter.

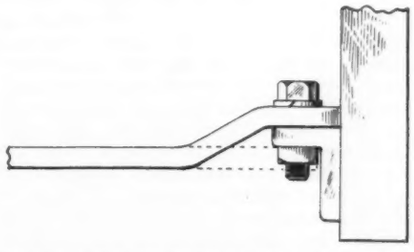
Boom Hoist Controls Dead Block

Loaded cars are let down an incline to the tipple by gravity at the No. 1 mine of the Anchor Coal Co., Highcoal, W. Va., two loads being employed to pull up two empties. Loaded cars are held at the top of the incline by a car stop or dead block until the rope is coupled. Depressing this dead block to allow the cars to start down the incline formerly required the services of a man to pull on a long lever, to which was attached a rope running to the block. To eliminate this man, an old boom hoist was installed and is operated by the coupler, who pushes a button to actuate an across-the-line starter, which in turn starts up the hoist motor. When the trip is over the block, the reverse button is pressed and the block is raised to the stop position by a counterweight as the rope slacks off. Van B. Stith, superintendent of mines, furnished the above description of the installation.

Boom Hoist Replaces Man in Operating Dead Block.

Locking Bolt and Nut Keep Suspensions Tight

Changes in equipment design have closely followed service experience, with the result that constantly improved renewal parts are offered for mining machinery. An example is furnished by a type of mine locomotive in which the motor suspension bar is fastened rigidly to the frame. The offset bar now supplied rests on the top of the bracket or supporting angle instead of hanging below it and depending on the bolts to carry the weight. Locomotives at the Burnwell (W. Va.) mines of the Imperial Colliery Co. have been fitted with this new type of suspension by A. E. Hudson, chief electrician, who added a further safeguard not often encountered. This was based on the use of large square nuts, mounted so that they cannot turn, in place of the hex nuts formerly employed.



Details of Method of Attaching Suspension Bar to Side Frame.

The sketch shows the new suspension, dotted lines indicating the position of the original bar with the weight on the bolt and lock washer. Due to broken lock washers and other causes, the nuts often loosened up. Loss of both nuts allowed that end of the bar to drop. When the new suspension bar was adopted, the bolts were installed with the heads up and were screwed into large square nuts which cannot turn because their corners strike the bracket. A heavy spring lock washer is used under the bolt head, thus locking both bolt and nut. This arrangement has eliminated all trouble with suspension-bar attachments.

WORD from the FIELD

University Stages Short Course On Coal Utilization

A special three-day course on coal utilization for coal producers, combustion engineers, salesmen, purchasing agents and retail coal merchants will be staged by the University of Illinois at Urbana, Ill., July 12-14. The course covers the entire field of coal utilization with special emphasis on preparation and combustion and on the use of combustion equipment. President Arthur Cutts Willard, formerly dean of the college of engineering, will open the course.

Joseph Harrington, Presidential member of Division II, Coal Code Authority, will discuss what the coal salesman and retail dealer should know and also will be heard at a later session on types of combustion equipment. Coal types, composition, analysis and combustion will be presented by A. C. Callen, head of the department of mining and metallurgical engineering; D. R. Mitchell, assistant professor in the same department, will cover coal preparation, and W. H. Severns, professor of mechanical engineering, will have a paper on combustion equipment and the fundamentals of space heating. The engineering problems of the retailer will be treated by W. J. Woodruff.

Meeting changing consumer demands will be the theme of an address by E. R. Keeler, vice-president, Franklin County Coal Corporation. Fred Miller, preparation engineer for the same company, will discuss preparation problems in relation to the sales department and consumer requirements. How recent preparation trends interest the retail dealer and the consumer will be outlined by W. C. Adams, Koppers-Rheolaveur Co. Interrelationships of combustion engineers, plant engineers, purchasing agents, retailers and coal salesmen will be presented by J. G. Bentley, fuel engineer, Sahara Coal Co. General trends and developments as they affect retailers and wholesalers will be treated by Marc G. Bluth, assistant secretary, Committee of Ten. There also will be addresses on the relation of retailer, consumer and producer; fundamentals of industrial fuel purchases and comparisons between coals and other fuels. Each session will close with an open forum discussion.

Kentucky Department Expands

Effective July 1, the name of the Kentucky State Department of Mines was changed to the State Department of Mines and Minerals and the Kentucky Geological Survey was absorbed into the enlarged department. John F. Daniel continues as chief of the expanded department. On the same day the new State mining law which brings all commercial operations in the State under the jurisdiction of the department also went into effect.

L. C. Madeira III Elected Head Of Anthracite Institute

Louis C. Madeira, III, was unanimously elected executive director of the Anthracite Institute, New York, at a meeting of the directors, May 31.

Since leaving college in 1914, Mr. Madeira has been connected with Madeira, Hill & Co., an independent anthracite company founded by his father, Percy C. Madeira. The younger Mr. Madeira was vice-president of the producing company at the time of his election as executive head of the institute, and was a director of a number of other companies in both the anthracite and the bituminous fields. Before taking his new post, however, he resigned all these connections.

Louis C. Madeira, III.

Reenters European Market

Pennsylvania anthracite, which has seen its home markets invaded by Scotch, Welsh and Russian anthracite since the World War, made a bid for the recovery of some of the European business it lost during that period when the Italian steamship "Chisone" cleared Port Richmond (Philadelphia) with a cargo of 7,500 tons of domestic sizes for Italy June 16. The Philadelphia & Reading Coal & Iron Co. supplied the coal—the first cargo of Reading anthracite to clear for a European port since 1921. The sale, said A. J. Maloney, president of the company, was made possible "by the favorable exchange position of the American dollar abroad."

Reduced Appropriations Curtail Work of Bureau of Mines

While the U. S. Bureau of Mines enters its new fiscal year with an appropriation only $60,000 less than that available for the year ended June 30, restoration of the 5 per cent pay cut will mean that at least 30 additional members of the staff will have to be dropped. Plans for reviving work on explosives have gone by the board, and Dr. C. E. Monroe and members of his staff who have specialized in explosives studies have been victims of the curtailment program. The total allotment for the year is $1,197,926.

Thanks to allotments from PWA, however, the Bureau is making decided headway in the repair and improvement of its physical properties. The entire entry of the Bruceton (Pa.) experimental mine is being rebuilt with concrete. This will make it possible to withstand the heaviest coal-dust explosions staged there. Heretofore these explosions have worked havoc with the entry, making for delay while it was being repaired.

The first story of an extensible building has been constructed at the Pittsburgh experiment station. This will serve as the basement for the structure which it is hoped ultimately to build and it is being equipped with railroad tracks so that mine-rescue cars now out of service and occupying rented space on railroad sidetracks can be stored in the building. At present eight of the eleven cars have been withdrawn from active service.

Safety Certificates Awarded

A Holmes Association certificate was presented to John A. Templeton, president, Linton-Summit Coal Co., at a special State-wide safety meeting at Linton, Ind., June 16. The certificate was in recognition of a 15 months' haulage record at the Twin No. 1 mine without a lost-time accident. Francis Feehan, U. S. Bureau of Mines, made the presentation. A. G. Wilson, chief of the Indiana Department of Mines and Mining, and Robert J. Smith, president, Princeton Mining Co., spoke at the joint rally of operators and miners, which also was addressed by Harvey Cartwright, commissioner, Indiana Coal Operators' Association, and Frank Wilson, president, District 13 (Iowa), United Mine Workers.

The record of the Nellis (W. Va.) Coal Corporation in handling 1,267,488 tons of coal from May 5, 1929, to Sept. 21, 1933, and of operating the tipple force from Sept. 30, 1927, to Dec. 1, 1933, without a lost-time accident was signalized on May 18 by presentation of Holmes Association certificates. The presentation was made by S. P. Howell, U. S. Bureau of Mines. J. C. Miller, president, Nellis Coal Corporation, accepted the awards on behalf of

the mine. Charles W. Connor, superintendent of mines, explained that these two awards made five certificates received by Nellis since 1930.

The King No. 2 mine of the United States Fuel Co., Mohrland, Utah, also has received a certificate in recognition of operating from Oct. 17, 1932, to Oct. 27, 1933, without a lost-time accident. During that period, 225,621 tons was produced with 213,028 man-hours of exposure. W. N. Wetzel is superintendent of the operation.

New Preparation Facilities

New contracts and construction of preparation-plant facilities at various coal operations were reported as follows in June:

AMIGO COAL CO., Amigo, W. Va.; contract closed with Jeffrey Mfg. Co. for remodeling present tipple and screens and installing 3-compartment jig, crusher and mixing system; total capacity, 180 tons per hour; cleaning capacity for 3x⅜-in. washed coal, 90 tons per hour.

COVINGTON COAL CO., Tahona, Okla.; now completing new all-steel 7-track tipple equipped with shaker screens, picking tables and loading booms for two sizes of lump, egg, three sizes of nut and slack; capacity, 200 tons per hour.

HUME-SINCLAIR COAL CO., Hume, Mo.; contract closed with McNally-Pittsburg Mfg. Corporation for Norton washer treating 6x3-in. coal at the rate of 150 tons per hour.

LILLYBROOK COAL CO., Lillybrook, W. Va.; contract closed with Kanawha Mfg. Co. for cleaning plant for stove coal, consisting of conveyors, hydro-separator, sludge tank and conveyor, with a capacity of 50 tons per hour.

TENNESSEE CONSOLIDATED COAL CO., Palmer, Tenn.; contract closed with Morrow Mfg. Co., for five-track shaker screens, feeder, mine-run and slack conveyors; capacity 250 tons of mine-run per hour.

TRUAX-TRAER COAL CO., Elkville, Ill.; contract closed with McNally-Pittsburg Mfg. Corporation for rescreening plant for making two additional nut sizes; capacity 200 acres per hour.

UNITED ELECTRIC COAL COS., Fidelity, Ill.; contract closed with Koppers-Rheolaveur Co. for washing plant in new structure adjacent to present tipple to handle 600 tons per hour of minus 3-in. coal. Rheo units will clean both coarse and fine coal; Carpenter dryers will be used with ¾-in.x48 mesh washed coal and a Dorr thickener for water reclamation. Minus 48- or 65-mesh product will be wasted. The washing plant will be equipped to screen out 3x2-in., 2x1¼, 1¼x¾, ¾x⅛-in. and ⅛-in.x48-mesh.

WEBB COAL MING MINING CO., Garrison, W. Va.; contract closed with Morrow Mfg. Co. for 4-track shaker screens, crushers, loading booms and conveyors; capacity, 300 tons per hour of mine-run.

Sinking a New Slope

The Cane Creek Coal Mining Co. is sinking a new slope on its property at Bankhead, Ala., to develop new acreage. The output will be transported to the present tipple for handling at the existing cleaning plant.

Southwest Deep Mines Win Wage Cuts; Division Labor Boards Active

REDUCTIONS in basic minimum wage rates for deep mines of the Southwest, renewed efforts by the Progressive union to use NRA machinery to force referendums at Illinois operations under contract with the United Mine Workers, orders for elections to determine whether company unions or the Lewis organization should speak for the workers at certain Southern mines not parties to the Appalachian wage agreement and, in the anthracite region, the continued grind of grievance cases before James A. Gorman, sitting as representative of the National Labor Board, signalized the major developments on the coal-mine labor front last month.

The order revising wage bases in the Southwest was issued June 4 to become effective one week later. Under this order, officially Amendment No. 3 to the code, the basic minimum hourly rate for inside skilled labor at shaft, slope and drift mines in Arkansas, Kansas, Missouri and Oklahoma is fixed at 57.1c. The rate originally established by the "emergency" order of March 31 (*Coal Age*, Vol. 39, p. 196) was 65.7c. This was reduced under the order of April 22 to 62.1c. The code rate prior to April 1 was 46¾c. per hour for an 8-hour day; all the new rates are on the 7-hour basis. The new minimum for outside common labor is 50.4c. per hour, as compared with 57.1c. under the order of March 31 and 53.6c. under the order of April 22. The rate prior to April 1 was 41c. Basic minimum rates for strip mines continue at the levels ordered April 22—Viz., 62.1 and 53.6c.

Revisions in the Southwestern rates were made after heated protests by the operators, the practical suspension of all deep mining, threats of court action and a special field investigation by Godfrey M. S. Tait, of the NRA technical staff. While operators are not satisfied with the new arrangement, reports from the Southwest indicate that the order will be accepted without contest. A tentative agreement on the new scale already has been worked out in the Arkansas-Oklahoma field and has been submitted to Washington for approval.

Strip Mines Sign New Scale

Strip mines in the Southwestern Interstate Coal Operators' Association signed a revised agreement with the union June 20, making the new scale retroactive to April 22. Disagreement on rates and hours for monthly men was referred to the Southwestern Interstate Joint Commission for settlement. Deep-mine producers in Ray and Clay counties, Missouri, began negotiations with the union for a contract on the new scale at Moberly, Mo., June 25. Other deep-mine operations are preparing to start up under the revised basis as soon as business warrants.

The new NRA order incorporates the prohibition against sales by Southwestern operators in the normal consuming markets of districts paying higher wages at prices below those charged by the higher-rated districts. This ban against "destructive invasion" of competitive consuming markets, first announced in connection with the downward revision of wage bases in Division II, April 22, is also made applicable to western Kentucky, where enforcement of higher wages by NRA order was enjoined by the U. S. District Court.

Formal appeal from this decision was filed in the U. S. Circuit Court of Appeals at Cincinnati, Ohio, on June 20. The government contends that Judge Dawson erred in holding that mining was not commerce. Unless the government succeeds in obtaining a writ of supersedeas to set aside the injunction pending final decision by the appellate court at the October term, the *status quo* will be maintained. An application for such a writ was denied by Judge Allen on the ground that the case was so important that it should be heard by the whole bench. The government plans to present arguments in support of the supersedeas early this month.

Criticize Division Board

The breach between M. S. Johnson, chairman of Division IV Labor Board, and operators in that division, which started with the decision in the Marriott Coal Co. case, is still unclosed. In this case, the first decided by the board, it was charged that the complaint was brought by an officer of the union and not by the employees of the company, that the board questioned the men in public hearing and did not hold a secret election and that the board exceeded its authority in recommending that the company and other operations in that section meet with "the selected representatives of your employees" to work out an agreement.

The decision against which protest was registered at Washington was tantamount, in the opinion of protesting operators, to directing mines which might have satisfactory relations with their workers to scrap those relations and sign a closed-shop agreement with the United Mine Workers. These and similar protests against what some operators term the "union organizing activities" of the impartial chairman have been ignored. As a result, the employers' representative on the board has declined to be a signatory to decisions of this character. Two of the most recent rulings involve the Missouri City Coal Co. and the Big Valley Coal Co., wagon mines charged with paying as low as 15c. per hour.

Following the refusal of the Labor Board for Division II to order a statewide referendum in Illinois to determine whether the United Mine Workers or the Progressives should represent the men, the new union demanded that NRA order an election in the Peabody mines. A conference on this demand was held June 13 between Wayne Ellis, deputy administrator, and George Dowell, attorney for the Progressives, who asserted that the majority of the Peabody workers is affiliated with the new union. Such an order would be

bitterly opposed by the United Mine Workers and might, it is said, even result in "protest" walkouts.

Reopening of the Peerless mine by the Peabody company in the Springfield district late in May was followed by the stabbing of a miner on his return from work and an attempt to bomb the substation. An explosion on June 17 damaged the electrical and water systems of the mine and also injured the airshaft.

Company Union Wins at Dante

Elections were ordered at the Widen mine of the Elk River Coal & Lumber Co. and the Dante operations of the Clinchfield Coal Corporation by Division I Labor Board—South. The Dante election, held June 16 and supervised by Charles B. Barnes, chairman of the board, resulted in 546 votes for the Clinchfield Employees' Association and 274 votes for the United Mine Workers. About 97 per cent of the men employed on the day a strike was called early in April took part in the election. Because the Elk River company challenged the jurisdiction of the board, its findings were transmitted to NRA with a request that Washington order an early election open to all workers on the Widen payroll April 30, 1934.

In the case of the Henry Clay mine of the Edgewater Coal Co., Pike County, Kentucky, the board ruled that employees had been denied their rights under NIRA and the code. The board held that all employees out at the time of its investigation who were on the payroll during the first week of January should be returned to their former positions without discrimination and without being required to sign any labor contract or join any particular labor organization.

The board also ordered the U. S. Coal & Coke Co., Lynch, Ky., to restore two employees discharged for alleged union activities. The men involved were James L. Westmoreland, president of local 6067 of the United Mine Workers, and Albert E. Timmins. The case of Timmins came before the board as a result of a letter by Mr. Timmins to President Roosevelt, May 22. The mine was ordered to reinstate the men by June 26. Another decision of the same board under Art. V (b) of the code directed "all mines coming under its jurisdiction which are still not equipped to weigh coal to install proper scales on or before July 15, 1934."

Answering the question whether development work is mining, Division I Labor Board—North has ruled that as long as a company mines and sells coal it is under the code. Tipple construction, however, is not subject to code provisions. This decision was handed down in a case brought by the union against the Berthy Coal Co. The board also ruled that employees at work when mining operations are discontinued should be given employment without prejudice before new men are taken on when operations are resumed.

Older men should not be discharged when they cannot produce as much as younger workers but should be given an opportunity for employment at work they are competent to perform, declared the Division II Labor Board in the case of the Riverside Coal Co., Edwardsport, Ind. Discharge for drunkenness and for repeated absences without permission was upheld in a complaint involving the Russell mine, Yeddo, Ind., but the board found that evidence charging a man with driving a room entry in such a manner that it was dangerous was hardly sufficient to prove the incompetence of the worker and directed his reemployment. Recognition of the right of individuals who own a mine to operate it themselves was given in the case of the White Ash Coal Co., Wheatland, Ind.; if additional men are taken on, however, said the board, code provisions must be observed.

The North-South wage differential commission provided for in the new Appalachian agreement held its first meeting at Washington, D. C., June 21 and made plans for the study of statistical forms and other data now being requested by NRA. Operators present were: Charles O'Neill, Peale, Peacock & Kerr, Inc.; J. D. A. Morrow, Pittsburgh Coal Co., and W. L. Robison, Youghiogheny & Ohio Coal Co., representing the Northern fields, and J. D. Francis, Island Creek Coal Co.; Ralph Taggart, Stonega Coke & Coal Co.; L. C. Gunter, Southern Appalachian Coal Producers' Association, and C. A. Cabell, Carbon Fuel Co., representing the Southern high-volatile fields. Northern West Virginia had no representative at the meeting.

The United Mine Workers were represented by the following district presidents: James Mark, district 2; P. T. Fagan, District 5; Percy Tetlow, District 6; Frank Miley, District 31; Van A. Bittner, District 17; William Turnblazer, District 19; Dale Stapleton, District 28, and Samuel Caddy, District 30. David J. McDonald, United Mine Workers, was made secretary and Mr. Robison assistant secretary. Thomas Kennedy, international secretary-treasurer of the union, and John Battle, executive secretary, National Coal Association, were made joint treasurers.

Trouble in Southern Fields

Miners at the Moss & McCormack operation struck last month, charging that the company was not observing the code wages. The management declined to make any statement public on the situation. Indictments have been returned against 22 men charged with intimidating Tommy Moore, a miner, in the Hazard (Kentucky) field because he had refused to join the United Mine Workers. Operators report that similar incidents have occurred in other parts of the field. Mines of the Blue Diamond, Alcoma Block, Harvey, Kentucky Eagle and Ajax companies are down and operators say they will not reopen until disorders have been checked.

Hearings before Mr. Gorman, umpire of the Anthracite Conciliation Board, which began several weeks ago, are the outgrowth of the insurgent strikes which took place in the hard-coal region last winter (*Coal Age*, Vol. 38, p. 430; Vol. 39, pp. 35, 82). After holding one investigation by a special committee of its own choosing, the National Labor Board designated Mr. Gorman to hear the complaints made by members of the United Anthracite Miners against the operators and the older union. These complaints alleged discrimination, failure of pit committees to protect the rights of the miners, illegal discharge and also attacked the contract system. A number of the complaints have been consolidated and the umpire has further expedited the proceedings by refusing to consider claims already covered in cases before the conciliation board.

Several hundred workers at the Harry E. colliery of the Wyoming Valley Collieries Co. struck June 20 following the laying off of a small group until July 1 because of curtailed operations. Local union officials charged that the layoff hit old workers while some men more recently employed were kept on the job. Members of the Butler local of the United Anthracite Miners voted June 19 to accept the offer of the Pittston Co. to reopen the colliery, which has been idle two years. Thomas Maloney, district president of the new union, declared he would not sanction the reopening at a reduction in wages, but the local ignored his objections.

Approve Divorce of Peabody From Insull Group

Divorce of the Peabody Coal Co. from control by the Insull utility interests through a revision of sales contracts and surrender of Peabody stock by the utilities was authorized at a meeting of the stockholders of the coal company at Chicago, June 18. The approval, however, was limited to authorizing the directors to carry through the proposed plan, because the arrangement must be passed upon by the Illinois Commerce Commission.

Under the plan tentatively indorsed, contracts entered into six years ago which provided that certain of the utilities, including the Commonwealth Edison and the Peoples Gas Light & Coke Co., should take 90 per cent of their requirements from Peabody would be revised to reduce the percentage to 75 at prices which would net the coal company 15c. per ton. The 15c. figure was part of the original contracts, but was subsequently revised to permit an 8 per cent allowance on the company's investment. A contract with the Middle West Utilities Co. was abrogated some time ago.

In consideration of these revisions, the Commonwealth and Peoples companies, subject to the approval of the State commission, have agreed to surrender 991,499 shares of the Class B stock of Peabody to the coal company. It is further provided that the coal company will reconvey title to the Black Mountain Coal Corporation (Kentucky) to the gas company for the payment of $97,500 in cash and the surrender of 195,881 B common shares, 27,290 A common shares and 8,450 shares of preferred stock of the Peabody company.

Fire Damages Tipple

Fire of undetermined origin damaged the topworks of the Blue Bird Anthracite Coal Co., near Clarksville, Ark., on June 17, burning the tipple and washery. The loss, partially covered by insurance, was estimated at $40,000. The mine had been idle since February.

NRA Takes Active Command of New Drive For Correlation of Code Prices

ACTIVE leadership of the movement to effect a satisfactory correlation of bituminous coal prices was assumed by NRA headquarters at Washington, D. C., early last month. Following meetings of representatives of subdivisional code authorities of Divisions I and II at New York and Washington June 5-7, Charles E. Adams, who succeeded K. M. Simpson as NRA division administrator on June 1, addressed a letter to all Presidential members and chairmen of code authorities declaring that "an emergency exists which warrants prompt action." Pending further study of a permanent method for dealing with price-correlation problems, Mr. Adams "requested" that, until Sept. 1, the industry follow the procedure proposed at the New York meeting for giving affected subdivisions an opportunity to be heard before any price changes are approved.

Under this procedure, which is a modification of the plan suggested last winter by some of the subdivisions of Division I (*Coal Age*, Vol. 39, p. 80), all changes must be approved by the proper code authority at least ten days prior to their effective date, and copies of the new schedules must be mailed to the deputy administrator, each Presidential member and the secretary of each subdivision affected by such changes.

Must Meet at Washington

A meeting of all Presidential members, code-authority and marketing-committee chairmen, with such other representation as the code authorities may desire, must be held in Washington at least five days before the effective date of any price change so that the Presidential members and the deputy administrator may exercise the powers of review contemplated in Sec. 4 of Art. VI of the code. No prices will be approved by the Presidential members until full opportunity has been given to all interested subdivisions "to object to any prices which such subdivisions may consider unfair market prices." In the absence of prompt settlement of controversies so arising, the question shall be referred to the National Recovery Administrator for final decision.

In view of negotiations and agreements in Alabama, the Southwest and Rocky Mountain States prohibiting "destructive invasions" of consuming markets by Alabama and the Southwest under the downward revisions of wage rates given those sections, the first meeting, called for June 25 at Washington, was confined to subdivisions of Divisions I and II. Representatives of the three remaining divisions, however, are subject to call if price schedules filed by any of them are protested. A meeting to correlate Southwestern prices (Division IV) with prices in Divisions II, III and V was set for Kansas City, Mo., on June 29.

The question of price relationships has been a sore point from the day the code became effective, last October. Starting first in Illinois and Indiana, where disagreement and threats of reprisals led Division I to protest to NRA that these disputes were threatening the stability of the Division I price structure, the question soon was aggravated by internal conflicts within Division I. These began when certain subdivisions took a leaf out of the Illinois-Indiana plans and inaugurated varying schedules for the same coals in different consuming markets. Alabama also established a zone-price system. In addition, price schedules were filed and then suddenly withdrawn, moratoriums were set up against contracting, modified and withdrawn, increasing competitive bitternesses and arousing resentment among consumers.

Further evidence of consumer dissatisfaction is found in a survey made early last month by the Fuel Engineering Co. of New York. This survey, covering the reactions of 340 industrial consumers in the Middle Atlantic and New England States with aggregate annual purchases approximating 11,000,000 tons, shows 69 per cent of the consumers representing 87.6 per cent of the tonnage favoring buying under pre-code conditions. While disclaiming higher prices under the code as a reason for taking this attitude, the dissenters base their objections on price-fixing, the elimination of competition and classification. Sixty-five per cent of the buyers expressed the opinion that the code-price system makes the selection of the most economical coal more difficult; buyers of 34 per cent of the reported tonnage have changed their coal as a result of the code-price structure.

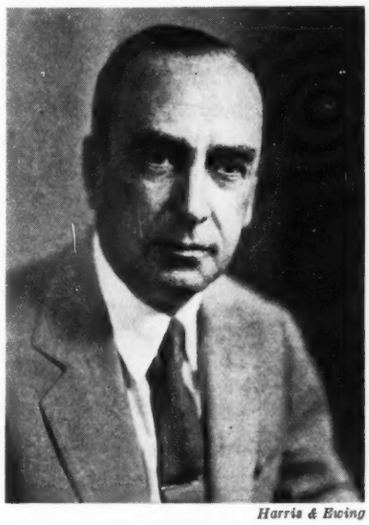
That the industry itself still believes price-fixing essential to the successful operation of the code was demonstrated by the flood of protests reaching Washington when NRA announced its new general policy on price fixing June 7. That policy banned all price-fixing in new codes except in emergencies and called for negotiations for amendments to existing codes to make them conform to the new policy. As one high official of NRA jocularly explained it, "Deputy Administrator Ellis received so many telegrams of protest he couldn't get out of his office." Mr. Ellis promptly wired all code authorities that the new policy did not affect the bituminous code.

No Ban on Price-Fixing

In a supplemental statement released June 9, General Johnson, while reiterating the hope that industries already under codes would fall in line with the new policy, promised that "in no event will there be any imposed change in an approved code or any change suggested without relation to the particular conditions in that industry." NRA officials directly concerned with the administration of the bituminous code privately disclaimed any intention of initiating steps to wipe out the price-fixing provisions.

Problems of enforcement, however, continue to plague the administration. Violation of code prices on Louisville & Nashville railway-fuel contracts in eastern Kentucky and Tennessee (*Coal Age*, Vol. 39, p. 254) was compromised by reductions in code minima on railway fuel in Southern Subdivision No. 2 of Division I to a level somewhat above the prices at which the L. & N. had negotiated. Thereupon, the railroad announced that it would purchase its requirements at the revised code prices. Everybody involved in the controversy, which had been aired before the compliance division of NRA, was reported to be satisfied and earlier threats of federal prosecution were lost in silence.

Another test of NRA powers was promised when Ballard Gearhart, Palisades, Colo., who had been haled before the U. S. District Court at Denver, Colo., charged with selling below code prices, elected to challenge the constitutionality of NIRA. Earlier reports from Washington (*Coal Age*, Vol. 39, p. 254) had represented Mr. Gearhart as being ready to recant and promise compliance with the code. Late in May, the Oskaloosa (Iowa) Coal Co. was ordered to surrender its Blue Eagle for selling under code prices. The code received the sanction of the U. S. District Court at Fort Smith, Ark., June 19, when a permanent injunction against violating its provisions was issued



Harris & Ewing

Charles Edward Adams

Who succeeded K. M. Simpson as NRA divisional administrator June 1 in charge of coal and a number of other important codes, was born in Toledo, Ohio, Oct. 29, 1881, and educated at St. Paul School (Concord, N. H.) and Yale University, receiving his A. B. degree in 1904. From 1907 to 1918, Mr. Adams was in the stock brokerage business and for the last two years of that period was a member of the firm of Foster & Adams. He was treasurer of the Air Reduction Co. from 1918 to 1920, became vice-president in 1920 and has been president since 1921; at present he also is chairman of the boards of the U. S. Industrial Alcohol Co., U. S. Industrial Chemical Co., Pure Carbonic Co. and National Carbide Corporation, and a director of Commercial Acetylene & Supply Co., Cuban Air Products Corporation, Sterno Corporation and the Vanadium Corporation of America. Prior to taking over the divisional administratorship, Mr. Adams had earned his spurs with NRA as a deputy administrator in charge of finance and insurance codes.

against the Blue Ribbon Corporation, Paris, Ark. The coal company had been charged with price and discriminatory discount violations, misrepresentation of sizes and violation of the provisions governing hours of labor.

In addition to the proposals on price-correlation, the New York-Washington meeting also decided that nothing constructive would be accomplished at this time by amending the code to provide for tonnage allocation by voluntary action of the operators. The meeting did recommend, however, that the code be amended to require each subdivison to set up a statistical bureau with which the producers would file reports on spot orders, contracts, credit data and any other information which the subdivision code authority, with the approval of its Presidential member, might demand. Costs of bureau administration would be prorated on a tonnage basis.

Presumably these bureaus would act as clearing houses for the collection of the cost and labor reports necessary to carry forward the studies started by NRA in its November, 1933, reports (*Coal Age*, Vol. 39, p. 137). Attempts to continue this work on a purely voluntary basis have not met with the success at first anticipated. Division V has declined to go along with the program; disaffection in the Rocky Mountain States is attributed to the failure of NRA to use the November figures as the basis for the recommendations contemplated by Art. V of the code. Objection has been raised in certain other quarters against making composite subdivisional and divisional figures public.

Changes in Code Authorities

Otto Herres, United States Fuel Co., has been elected chairman of the recently organized Utah subdivisional code authority of Division V; W. C. Stark, Blue Blaze Coal Co., is vice-chairman, and B. P. Manley is secretary-treasurer. A. Lisle White, Virginia-Maryland Coal Corporation, has been elected president of the northern West Virginia subdivisional code authority of Division I, vice R. M. Hite, Virginia & Pittsburgh Coal & Coke Co.

J. R. Henderson, formerly assistant to Joseph Harrington, Presidential member of the divisional code authority, has been appointed managing director of the Illinois subdivision, vice B. R. Gebhart, who recently resigned to become assistant to the president of Appalachian Coals, Inc.

Receipt of the first of the proposed subdivisional budgets was announced by NRA on June 18. Northern West Virginia asked for approval of a budget of $153,000 for the year ending April 30, 1935, to be financed by an assessment of 7 mills per ton. Southern subdivision No. 2 of Division I asked for $258,441 for the current calendar year, to be financed by an assessment of 5 mills per ton. For the year ending April 30, 1935, the Arkansas-Oklahoma subdivision submitted a budget of $19,842, based on an assessment of 2c. per ton.

Adjustment of federal government contracts to cover increases in costs directly chargeable to code compliance and the President's Reemployment Agreement was provided for in a bill passed during the closing days of Congress last month. Application of the benefits of the law is limited to contracts and bids submitted prior to Aug. 10, 1933, and performed wholly or in part subsequent to that date. Any award is further limited to an amount which would result in a profit not to exceed 7 per cent of the cost of performing the contract.

McGraw-Hill Anniversary Month

June was anniversary month for the McGraw-Hill interests. James H. McGraw, chairman of the board, McGraw-Hill Publishing Co., rounded out a half century of service in engineering and industrial publishing; *Power*, a McGraw-Hill publication, celebrated its fiftieth anniversary and the McGraw-Hill Book Co. completed its first 25 years of activity. This last anniversary was signalized by a special luncheon to executives of the company, the staff and authors, at the McGraw-Hill Building in New York on June 28.

Must Capitalize Equipment

The cost of additional items of plant and equipment necessary to maintain the same daily average output under the 7-hour day as was secured under the longer working day cannot be expensed, according to a ruling of the Commissioner of Internal Revenue. Charging such items to expense, he explains, is permissible only where necessary "to maintain the normal output of the mine because of the recession of the working faces."

Personal Notes

C. C. BALLARD, formerly divisional chief electrician of mines, New River Co., with headquarters at Sprague, W. Va., has been placed in charge of electrical operation and maintenance for all mines of the company. Mr. Ballard also is president of the New River and Winding Gulf Electrical and Mechanical Institute.

ALEX BEESON, Fairmont, W. Va., has been appointed an ancillary receiver for the Consolidation Coal Co. in West Virginia by U. S. District Judge W. E. Baker. Mr. Beeson formerly was general manager of the Four States Mining Co.

H. J. GENTRY, West Blocton, has been appointed associate mine inspector for Alabama, vice S. Y. Leith, who died on May 2.

R. S. GRAHAM, president, Kemmerer Coal Co., Norton, Va., has been elected a director of the Southern States Industrial Council.

W. J. JENKINS, president, Consolidated Coal Co. of St. Louis, has been elected a director of the National Coal Association.

JOHN L. LEWIS, international president, United Mine Workers, sailed for Europe May 30 to attend the International Labor Conference at Geneva as official representative of the U. S. Department of Labor.

JAMES A. LONG, formerly general manager, Woodward (Ala.) Iron Co., has been appointed Southern factory manager for the Macwhyte Co., Kenosha, Wis., with headquarters at Birmingham, Ala.

JOHN LOWRY, of Johnstown, Pa., has been appointed assistant general superintendent of the West Virginia Coal & Coke Corporation, with headquarters at Omar, W. Va.

WILLIAM F. NELLEN has been appointed foreman of the cleaning plant of the Jackson stripping of Carey, Baxter & Kennedy, producing coal for the Philadelphia & Reading Coal & Iron Co.

E. J. NEWBAKER, vice-president in charge of operations, Berwind-White Coal Mining Co., has been elected national chairman of the Coal Division of the American Mining Congress.

LEE OTT, for many years West Virginia State Compensation Commissioner, has been made general superintendent of the West Virginia Coal & Coke Corporation, with headquarters at Omar, W. Va. Mr. Ott, who was made acting general superintendent some time ago, succeeds Lafayette Tuck, who resigned because of illness.

W. M. ROBSON, for several years superintendent of the Blossburg "E" mine, Blossburg, Ala., has been appointed general superintendent of coal mines for the Brookside-Pratt Mining Co.

K. A. SPENCER, vice-president, Pittsburg & Midway Coal Mining Co., was elected president of the Southwestern Interstate Coal Operators' Association at the 31st annual meeting of that organization, held at Pittsburg, Kan., June 18.

BERTRAM DAVID THOMAS, a graduate of the University of Washington, has joined the staff of the Battelle Memorial Institute, Columbus, Ohio, where he will start laboratory research on colloids for coal preparation and iron-ore dressing.

SAM WOODHEAD, Independent Coal & Coke Co., Salt Lake City, Utah, has been elected president of the Utah Purchasing Agents' Association. It was erroneously stated in the June issue that he had been made president of the Independent Coal & Coke Co.

Obituary

GARNER FLETCHER, general manager, Mallory Coal Co., Huntington, W. Va., died in a Cleveland (Ohio) hospital, May 27, age 55. He joined the engineering forces the Consolidation Coal Co. in the late '90s and was later transferred to the operating force and made general manager of the Millers Creek division and still later general manager of all eastern Kentucky operations. He left Consol. to become general manager of the Elkhorn Piney Coal Mining Co. and resigned that post in 1919 to become general manager of the Mallory Co.

WILLIAM H. KOCH, general manager and one of the organizers of the Hitchman Coal & Coke Co., operating in the West Virginia Panhandle, died May 24. Mr. Koch also was an ancillary receiver for the Consolidation Coal Co. in West Virginia.

LILBURN T. MYERS, president, Virginia-Maryland Coal Corporation, and vice-president, Commonwealth Coal Corporation, died at a Richmond (Va.) hospital, June 14. Mr. Myers, who had been in ill health for some time, was born in 1857.

Injunction Against TVA Sought In War to Protect Coal

The war to protect coal against the encroachments of rival sources of power took a sharper turn June 14 when Alabama producers, supported by the ice industry of the Southeast, petitioned the U. S. District Court at Birmingham, Ala., for an injunction against the Tennessee Valley Authority and its subsidiaries. The court is asked to restrain TVA from carrying out present plans for the sale of electrical appliances, from competing with the coal industry in the sale of heat and power and from using public funds to construct hydroelectric plants with a capacity in excess of the primary power required for the operation of the proposed dams and locks and germane purposes and for the manufacture of nitrates or other directly potential war materials for the processing of which provision has been made or is assured.

Petitioners alleged that TVA organizations were operating in violation of the law and without constitutional sanction. Continuation of the program, it is charged, will mean annihilation of the coal industry of Alabama and other industries with which the government will be in direct competition and will jeopardize the livelihood of 20,000 miners' families. Directors of the National Coal Association, meeting in Washington, D. C., June 20, indorsed the action of the Alabama operators and pledged continued support in the prosecution of the fight.

The association also registered its opposition to dumping cheap foreign fuel oil on the American market. Its position on this subject was emphasized by John D. Battle, executive secretary, before the Senate subcommittee on mines and mining during hearings on the oil-control bill. This bill was sidetracked during the closing days of the session for a resolution for a Congressional investigation of the oil situation as a basis for legislation. The association joined with the United Mine Workers in protesting against the use of PWA funds for constructing an oil-burning municipal plant at Petersburg, Ill. Protest also was made to the petroleum code committee against the resolution of the Connecticut subdivision proposing guaranteed prices on long-term contracts with purchasers using other fuels.

A steady drum-fire against government expenditures for further hydroelectric developments is kept up by the National Job Saving and Investment Protection Bureau for the Coal Industry at Chicago, which recently cut loose with a blast on the plan to create another TVA in the Wabash River valley. A proposal of the natural-gas interests that the coal industry agree to the additional replacement of 1,620,000 tons of coal by gas for industrial purposes in Illinois, Indiana and Iowa coal markets was declined by the Illinois subdivisional code authority on May 24. This proposal was in line with recent offers of the gas people to set definite limits on their invasion of coal markets if the coal industry would abandon its campaign for further legislative control of gas.

The anthracite region is beginning to make it uncomfortable for industries in the hard-coal area that use other fuels. Some business houses in the region are refusing to purchase goods from companies using oil or gas. Retailers also joined the fight against competitive sources of power by denouncing the government's hydro-electric program at the 17th annual convention of the National Retail Coal Merchants' Association at Washington, June 18-20. This action followed an address by C. B. Huntress, president, Appalachian Coals, Inc., who declared the government program would throw 100,000 miners out of work and junk hundreds of millions of dollars of tax-paying coal properties.

Compensation Rates Reduced

As a result of the increases in wage rates since the adoption of the bituminous code, the Virginia State Corporation Commission has granted the request of the Bituminous Casualty Corporation, Rock Island, Ill., for permission to reduce its base rate on coal-mine compensation insurance from $6.25 to $5.80.

Back to Anthracite Power

The Equitable Building, New York, one of the world's largest office buildings, is abandoning the use of fuel oil in its heating and generating plant and will install new equipment to burn small anthracite, because of the increasing cost of bunker oil. For several years prior to 1923 the building used hard coal on hand-fired stationary grates; the new equipment includes the latest model Coxe stokers.

Old Ben Plans Reorganization

Application for reorganization under the new federal bankruptcy act governing corporation reorganizations was made to the United States District Court at East St. Louis, Ill., by the Old Ben Coal Corporation on June 16. The petition will come up for hearing before Judge Wham on July 12. In the meantime present officers of the company, headed by D. W. Buchanan, president, were authorized to conduct business "as usual" with the present staff pending further court proceedings.

In its petition, the company stated that it had assets of $27,500,000 and liabilities of $11,595,356. Under the plan of reorganization drawn up some time ago in anticipation of the new law, holders of $5,446,000 first mortgage bonds due Aug. 1, 1944, would surrender their bonds for 6 per cent income bonds payable Aug. 1, 1948, plus 14 shares of common stock for each $1,000 bond. Holders of $3,300,500 debentures due Aug. 1 would exchange these debentures for new 7½ per cent debentures plus 8 shares of common stock in the new corporation. Holders of preferred stock would surrender those securities and claims for unpaid dividends for common stock, share for share; holders of common stock would exchange their securities on the basis of ⅛ share of new common for each share of common in the old corporation.

All of the common stock, over 96 per cent of the preferred, 79 per cent of the bonds and 89 per cent of the debentures have been deposited under the reorganization plan.

Union Pacific Coal Old Timers Hold 10th Annual Reunion

Members of the Union Pacific Coal Co. Old Timers' Association held their tenth annual reunion at Rock Springs, Wyo., June 16. This meeting, the largest in the history of the organization, followed the pattern of previous reunions, starting with the annual business meeting, then the famous parade headed by Tom Butler, the oldest superintendent in point of service, as grand marshal; the McAuliffe Kilties and bands and drum corps from Superior, Winton-Reliance, Rock Springs and Hanna mines. Luncheon, at which the principal speaker was T. S. Hogan, chairman of the Division V Labor Board, followed; then the afternoon sports and teas and, in the evening, entertainment by mine talent and dancing at the Old Timers' Buillding.

Although only one veteran, Richard Gibbs, was invested with the 40-year service button by President McAuliffe, the present membership includes 49 workers who have served 40 years or more. Membership in the organization has grown from 283 to 635 and represents 31 nationalities. William McIntosh was elected president for the new year, succeeding D. V. Bell.

A field day participated in by 27 first-aid teams preceded the Old Timers' day. The team from Superior B, C and E mines took first place with 498⅛ points out of a possible 500; Reliance came second with 495⅜, and the Hanna No. 1 team third with 495 points. Hanna boy scouts led their division with 494⅜ points and the senior girl scouts from Hanna had a perfect score. Junior girl scouts from the same group also walked off with first honors.

Silver medals and certificates of honor were presented to seven men at Superior C mine for their work in rescuing two men from a fall of top coal May 9, 1933, by E. H. Denny, U. S. Bureau of Mines. Holmes Association certificates of honor were awarded to the Rock Springs No. 4 mine for operating from April 17, 1923, to Jan. 1, 1934, without a fatality; to Superior B mine for running from Jan. 8, 1932, to Jan. 1, 1934, and to Winton No. 1 for working from May 23, 1932, to Jan. 1, 1934, without a lost-time accident. Superior B mine also won the "Sentinels of Safety" trophy for its no-lost-time record last year.

Move for District Agency

Eastern Coals, Inc., the proposed agency for handling coal from the central Pennsylvania mines and related groups, has submitted a plan of organization for review and study by operators who have signified an interest in the creation of this district sales agency.

Proposes Joint Committee

Because of the differences of opinion developed on the question of the delivered values of ash and moisture and other combustion factors, the board of directors of the A.I.M.E., at a meeting in New York, June 21, adopted a resolution proposing the appointment of a joint committee of sixteen, drawn in equal numbers from the A.I.M.E. and the A.S.M.E., to study these questions and report on their conclusions not later than Feb. 1, 1935.

Purchasing Agents Discuss Coal Problems At Their Cleveland Convention

COAL and the bituminous code had an important place on the program of the 19th annual convention of the National Association of Purchasing Agents, at Cleveland, Ohio, June 19-21. Speaking at the luncheon meeting of the coal committee of the association, June 19, William Emery, Jr., chairman of the Ohio subdivisional code authority, declared that, while many problems still remained to be ironed out, the operation of the bituminous code had been beneficial to the mining industry. Similar views were voiced by Charles O'Neill, chairman, Eastern subdivisional code authority of Division I, in addressing the utility group, and by R. E. Howe, secretary, Appalachian Coals, Inc., who spoke before the pulp and paper manufacturers' group the same day.

From 1925 to the spring of 1933, when wages reached an all-time low, said Mr. Emery, operators in the Northern fields had been selling miners' wages, not coal. With labor approximately 64 per cent of the f.o.b. mine cost, increases in base rates from $2.50 to $4.60 per day have been a boon to the miners and have enabled the operators to stabilize business on a more profitable basis. With the influx of new production from new and reopened mines brought about by the sharp increase in prices after the code became effective, a more equitable allocation of tonnage and production control was necessary. Buyers, Mr. Emery thought, were still giving too much encouragement to ways and means of "beating the code" in negotiating new contracts.

Purchasing agents, in the discussion which followed Mr. Emery's talk, repeatedly expressed interest in the position of slack coal. Price differentials between mine-run and slack, Mr. Emery suggested, should be based on the relative B.t.u. values of the two sizes. Some of the committee thought that lower prices should be made in off-peak months to encourage stocking. Many purchasing agents felt special consideration should be given to large users, such as utilities, whose monthly consumption curve is fairly flat.

Current spot prices on bituminous coal, said H. T. Coates, regional chairman of the coal committee, New York, cannot be considered unduly high when wage increases and the past unprofitable history of the mining industry are taken into account. But, in the absence of further changes in conditions, "there would be no justification for raising prices higher." Mr. Coates criticized the tendency of some code authorities to put contract prices on the spot-market basis. General adoption of such a policy "would be a great mistake," since it would offer the buyer no inducement for contracting. Production-control schemes, such as recently advocated in Division I, would only complicate an already complex situation, result in higher prices and be of questionable benefit to the producer.

Thomas W. Harris, Jr., divisional purchasing agent, E. I. duPont de Nemours & Co., who presided at the meeting, reported briefly on the use classification of coal. Culminating six years of fact-finding and research, the sectional committee on classification of the American Society for Testing Materials has developed tentative specifications for classification by rank and grade. These specifications are included in the detailed report of the committee presented to the A.S.T.M. at its meeting in Atlantic City, N. J., June 27.

Outlining the origin of coal and present mining methods, Mr. Howe emphasized the important part played by labor in over-all production costs. In his field labor costs are somewhat higher than the 66 per cent average for the country as a whole. Investment in coal properties per ton of annual production is $7.06 in West Virginia and $6.34 in the other Southern fields. During the past year wage increases in these fields have approximated 75c. per ton. Production costs have been further increased by advances in the price of supplies.

To Open New Virginia Mine

A new mine is under development in Buchanan County, Virginia, by the H. E. Harman Coal Corporation, which has leased over 11,000 acres of coal land from the Bull Creek Coal Co. and other owners in that section. The company plans to put in modern equipment capable of stepping up the output to as large a capacity as the market will absorb. The development is in the Grundy field, which recently has been the scene of considerable activity.

Builds Tramway at Renton

A two-bucket type aerial tramway for handling heavy slate refuse has been installed at the Renton (Pa.) operations of the Union Collieries Co. The tramway is approximately 2,000 ft. long and will have an hourly capacity of 100 tons. Because it will operate over burning refuse dumps, the tail tower to support the cables above these dumps will be 235 ft. high. The contract for the installation was let to the Interstate Equipment Corporation.

Industrial Notes

WILLIAM R. ELLIS, formerly assistant to the general manager, has been appointed assistant general manager of the explosives department, Hercules Powder Co., Wilmington, Del.

LOUIS ALLIS CO., Milwaukee, Wis., has opened a direct factory branch office in the Bona Allen Building, Atlanta, Ga., to serve the Southeastern States. George C. Gardner has been appointed district manager.

SAFETY MINING CO., Chicago, announces that it has entered into an agreement with SULLIVAN MACHINERY CO., granting the latter organization exclusive license for the United States and a number of foreign countries on the Airdox method and apparatus. Safety Mining Co. will continue the sale and servicing of Cardox.

FABREEKA BELTING CO. has changed its name to Fabreeka Products Co. because of the increasing use of Fabreeka material for other than belting purposes and has removed its headquarters to larger offices at 77 Franklin St., Boston, Mass.

R. C. MUIR, manager of the engineering department, General Electric Co., has been elected vice-president in charge of the engineering department. E. O. SHREVE also was promoted to a vice-presidency and will be associated with J. G. BARRY, vice-president, in the commercial activities of the apparatus and supply business of the company, with headquarters at Schenectady, N. Y.

H. E. TIMKEN has resigned as president of the Timken Roller Bearing Co., but will continue as chairman of the board. WILLIAM E. UMSTATTD, executive vice-president, has been elevated to the presidency.

E. C. GAINSBORG, sales manager, Roller Bearing Co. of America, Trenton, N. J., has been appointed general manager of the company.

L. S. HAMAKER, sales promotion manager, Republic Steel Corporation, has been advanced to the position of vice-president and general manager of the Berger Manufacturing Co., Canton, Ohio. The Berger company is a wholly owned subsidiary of Republic.

REPUBLIC STEEL CORPORATION, Youngstown, Ohio, announces the appointment of Ohio Valley Hardware & Roofing Co., Evansville, Ind., as distributor of Toncan iron, and of Pidgeon-Thomas Iron Co., Memphis, Tenn., as distributor of Enduro stainless steel.

Scrip Provisions Again Stayed

The effective date of the restrictions on the use of scrip incorporated in the master retail code (*Coal Age*, Vol. 38, p. 385) and in the codes for the retail jewelry, food and grocery trades has been postponed to Dec. 1. This action, it was explained, was taken in order to give the committee headed by Dr. Charles Fowler, of City College, New York, an opportunity for further study of the economic and social implications of the provisions. The committee, appointed March 16, already has had several meetings with representatives of the coal industry maintaining company stores and plans to hold a hearing at Birmingham, Ala., July 2.

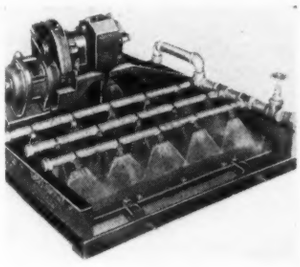
Upholds Import Coal Duty

Imposition of the customs duty of 10c. per hundred pounds on coal imported from Russia in 1932 was upheld by the U. S. Court of Customs and Patent Appeals on June 12. The decision of Judge Garrett affirming the judgment of the U. S. Customs Court denied the contention of the George E. Warren Coal Corporation that under the doctrine announced by the Supreme Court in the *Five Per Cent Discount Cases*, 243 U. S. 97, the effect of the words "unless treaty provisions otherwise provide" in the 1932 Revenue Act was to suspend the operation of the tax so long as the United States continues to have most-favored-nation clauses in any of its treaties and admits coal tax-free from any country where the balance of coal trade is against the United States.

WHAT'S NEW
IN COAL-MINING EQUIPMENT

Spray Nozzle

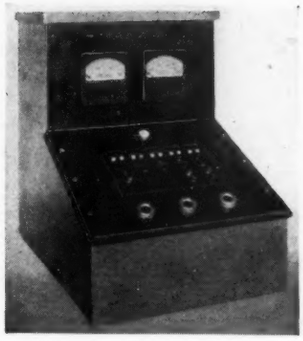
Deister Concentrator Co., Ft. Wayne, Ind., offers the new "Concenco" spray nozzle (J-132 Series) for 1-, 1¼- or 1½-in. spray lines. These nozzles are installed, according to the company, by drilling an oversize hole in the feed line and clamping the nozzle. A gasket prevents leakage, and no tapping is necessary. Before tightening the clamp, a number of nozzles can readily be aligned on a single feed pipe to give a single-sheet flow. Absence of



threads, it is pointed out, makes mounting and demounting easy and insures a perfect assembly each time the nozzle is replaced. An unrestricted orifice is said to reduce clogging when dirty water is recirculated. Discharge orifices come in four sizes: $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$ and $\frac{3}{8}$ in.

Supervisory Control

To meet the need for an inexpensive means for remote operation of various small stations, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., offers "Polaricode, Jr.," said to be a low-cost small-sized supervisory control for industrial service. It includes a raise-lower control combined with simultaneous telemetering indication of position for distant control of variable-position apparatus. The equipment, according to the company, is designed for application to small-transformer switching, distribution and tie-point substations; various single-unit automatic railway, mining and hydro stations; electrified pumping stations; industrial plant substations; and similar applications. The unit operates a maximum of five apparatus units and requires only two telephone wires between the



control station and the apparatus. All the functions of apparatus control, including continuous and individual signal lamp supervision, telemetering and synchronization, are performed by the equipment, according to the company.

Aluminum Vehicle

Quigley Co., Inc., 56 West 45th St., New York, offers the Triple-A No. 44 black anti-corrosive vehicle for aluminum, which it declares primes, protects and decorates surfaces in one operation. The base of the coating, it is pointed out, is a special black anti-corrosive vehicle, which penetrates and seals the pits and pores of the material to which it is applied, waterproofing the surface and preventing corrosion. To this vehicle is added aluminum powder which rises to the top and both protects and decorates the surface. Triple-A No. 44 coating, it is said, can be applied to damp surfaces, and no priming coat is necessary. It is adapted to both inside and outside use and to application by either spray or brush.

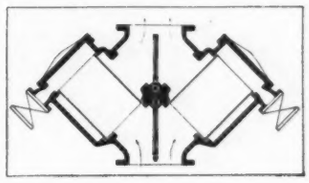
Instrument Switches

Roller-Smith Co., 233 Broadway, New York, has brought out a new line of instrument and control switches under the designation Type "R Rotary" for use on switchboards and control panels of all kinds. The instrument switches are used in connection with electrical measuring instruments and the control switches for establishing proper connections to air and oil circuit breakers and similar equipment. A switch for every known requirement is a feature of the new line, according to the company, which points out that current-carrying members are rated at 15 amp., 115 volt a.c., and are insulated for 600 volts to ground or between contacts. The switches may be mounted on panels $\frac{1}{8}$, $\frac{1}{4}$, 1, $1\frac{1}{2}$ or 2 in. thick.

Strainer

Freyn Engineering Co., 310 South Michigan Ave., Chicago, offers the Phillips "Twin-Basket" strainer embodying a back-washing feature which enables the strainer to be cleaned in operation without removing the baskets. The equipment comprises two baskets placed at 90-deg. angles with each other, through which the flow of water is controlled by two swinging gate valves. Strainer baskets are cylindrical in shape, open at the top and bottom and perforated to give the desired screen opening.

Under normal operation, both gate valves are open, the water entering at the bottom and dividing to pass through both baskets. To clean one of the baskets, the bottom gate valve is closed, cutting off the inlet. The bypass valve is then opened, with the result that clean water from the other basket is forced through the basket to be cleaned in a reverse direction, flushing the dirt out through the bypass valve. To

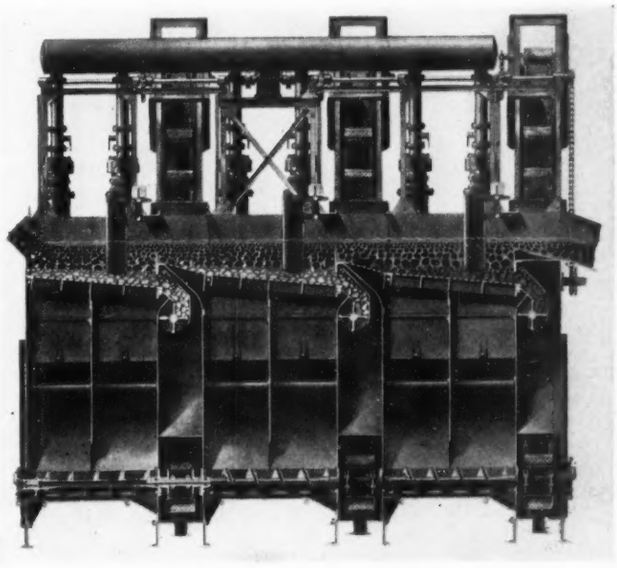


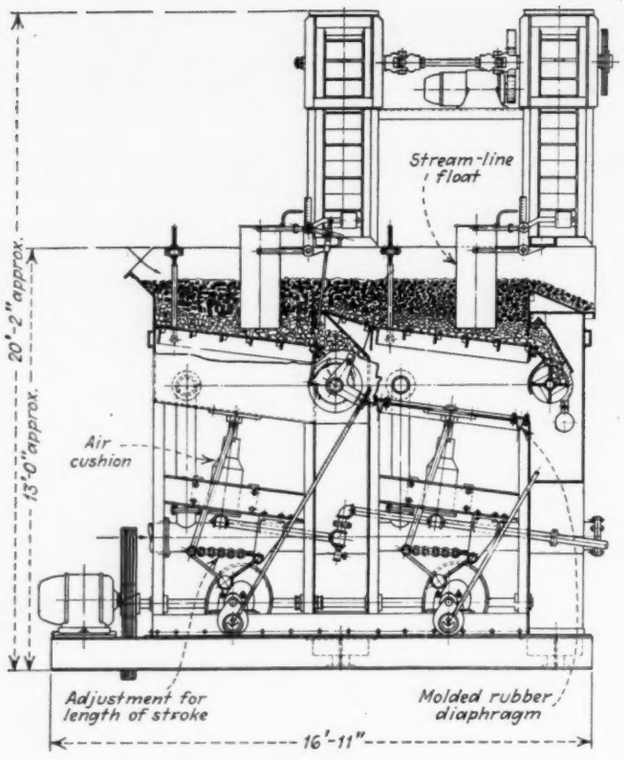
remove a basket for inspection, both gate valves are closed, after which the conventional procedure is followed. Baskets (brass with bronze top and bottom rings) may be obtained with $\frac{1}{8}$- to $\frac{3}{8}$-in. perforations—larger if desired. Cast-iron strainer housings are provided for pressures up to 125 lb. per square inch; cast steel for pressures up to 200 lb. per square inch. The strainer, according to the company, may be mounted in any position.

Coal Cleaners

Three new mechanical cleaners for coal—the Jeffrey air-operated jig, Jeffrey diaphragm jig and Jeffrey air launder—are offered by the Jeffrey Mfg. Co., Columbus, Ohio. One of the major features of the air-operated jig, according to the company, is an air valve which places definite control over the type of stroke, both suction and pulsion, in the operator's hands, thus adapting the jig to either a wide range of sizes

Jeffrey Air-Operated Jig.





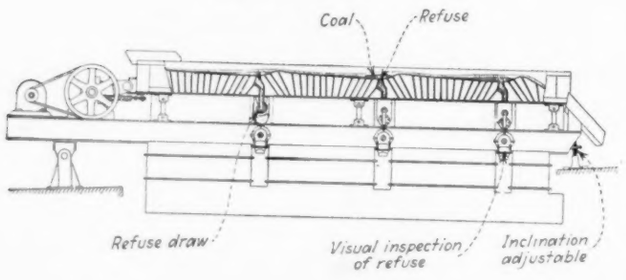
Jeffrey Diaphragm-Type Jig.

or nut and egg. Withdrawal of refuse is controlled automatically by a streamlined float actuating what is said to be a new design of ejector drive which increases or decreases the rate of rotation of the ejector in accordance with the change in quantity of refuse. Other features pointed out include: easy adjustment of screen-plate slope; straight upward flow of water, thus preventing interference with stratification; maintenance of stratification between compartments; and quick adjustment for desired bed depth.

Moderate price with high efficiency are two features claimed for the Jeffrey diaphragm jig, which utilizes the types of strokes developed with the air-operated jig. These strokes, opening up the washing bed from top to bottom, are produced mechanically by cams. Other features include: float-controlled ejector mechanism, permitting discharge of refuse as it accumulates on the screen, the slope of which easily is adjusted; equal efficiency with flat refuse; adjustable overflow lip for maintaining proper depth of refuse bed; maintenance of stratification between compartments; and inclusion of an air cushion to counterbalance the dead load on the diaphragm. Designs are available for egg, nut, stoker and pea-and-slack. The jig is built with single and multiple compartments with from 16 to 75 sq.ft. of screen area.

The Jeffrey air launder, says the company, is especially adapted to the cleaning of fine sizes. Deck contour is such, it is pointed out, as to facilitate natural stratification of coal and refuse; and gravitational flow is made possible through inducing a state of fluidity by properly coordinating mechanical agitation and upward air flow. This fluidity in a thin bed makes stratification rapid and complete, it is said. Other features pointed out include: positive and accurate control of air velocities over the entire deck surface, thus effecting and maintaining stratification, and refuse withdrawal over full width of deck into suitable pockets in the bottom of the launder, from which it can be removed as it accumulates.

Jeffrey Air Launder.



Motor Trucks

Mack Trucks, Inc., 25 Broadway, New York, has brought out two new cab-over-engine trucks bearing the designation "Traffic Type." The new design, it is said, provides one-third front and two-thirds rear loading, with the result that with the same maximum authorized tires the new Model

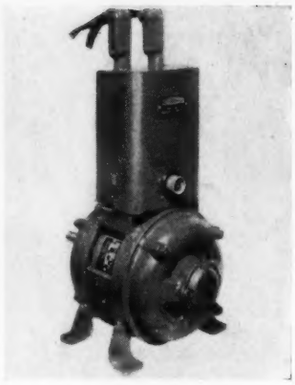
Mack Model CJ "Traffic Type" Truck.

CH, rated at 3 to 5 tons, can carry 1,100 lb. more than its conventional counterpart, and the new Model CJ, 3½ to 6 tons, can carry 1,200 lb. more. In addition, according to the company, turning radius is reduced 5 ft. and truck length 3 ft.

Self-Protected Motor; Welding Aids

Lincoln Electric Co., Cleveland, Ohio, announces a self-protected motor which it declares cannot burn out. A protective device is built into the windings, and should the motor be stalled through overloading, heat up due to poor ventilation, run single phase or be blocked for any other reason, the protector shuts off the current. The equipment also may be used to disconnect the motor automatically in case of high peak loads. A.c. induction motors with this protective feature are available in sizes from ¼ to 30 hp., either two- or three-phase, for standard commercial cycles and voltages. Controls are mounted on the motor.

Savings up to $500 per year per welder, better welds and increased output are claimed for the "Lincontrol" remote control



Self-Protected Motor

for arc-welding machines. Additional cables or other apparatus is not required, it is asserted. The operator taps the electrode on the work several times and the voltage automatically is raised, it is pointed out. A larger number of taps, and the voltage is lowered. The control mechanism is mounted in a small box which quickly can be attached to the welder voltage control. Regular hand controls may still be used afterward, if desired.

Lincoln Electric also offers "Wearweld," a new shielded-arc electrode for building up all steel surfaces other than the austenitic type to resist shock and abrasion. Deposits made with the electrode, according to the company, consist of an air-hardening alloy steel which is unusually tough and hard, running up to 50 to 55 Rockwell C scale. The electrode is available in ¼- and $\frac{5}{32}$-in. diameters in an 18-in. length.

Lincoln Electric Co. also offers the new "Shield Arc 85" welding electrode for high-tensile steels. This electrode, according to the company, is of the heavily coated type and provides welds with a tensile strength of 85,000 to 100,000 lb. per square inch and an elongation of 15 to 20 per cent in 2 in. It is suitable for flat, vertical and overhead welding.

Portable Blowers

Skilsaw, Inc., 3310 Elston Ave., Chicago, has announced a new line of portable ball-bearing electric blowers and suction cleaners, with which are combined separate units for blowing hot and cold air and also a blow torch. A major feature, according to the company, is a blast of dry air at high velocity and low pressure for cleaning motors, machinery, etc.

The company also offers a new line of portable ball-bearing electric drills.